NOIDA METRO RAIL CORPORATION (NMRC) LIMITED

REQUEST FOR PROPOSAL (RFP)

E tender No. NMRC/Office-connectivity/50/2018

For Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida

November 2018

Issued by:

Noida Metro Rail Corporation (NMRC) Limited
Block-III, 3rd Floor,
Ganga Shopping Complex, Sector-29, Noida -201301,
District Gautam Budh Nagar, Uttar Pradesh, India

Disclaimer

This Request for Proposal (RFP) Document (or ―E-Tender‖ or ―E-Bid‖) for ―Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida‖ contains brief information about the scope of work and selection process for the Bidder (_the Contractor‖ or ―the Tenderer‖). The purpose of the Document is to provide the Bidders with information to assist the formulation of their Bidding Documents.

While all efforts have been made to ensure the accuracy of information contained in this RFP Document, this Document does not purport to contain all the information required by the Bidders. The Bidders should conduct their own independent assessment, investigations and analysis and should check the reliability, accuracy and completeness of the information at their end and obtain independent advice from relevant sources as required before submission of their Bid/s. Noida Metro Rail Corporation Ltd. (―NMRC‖ or ―the Corporation‖) or any of its employees or advisors shall incur no liability under any law, statute, rules or regulations as to the accuracy or completeness of the RFP Document.

NMRC reserves the right to change any or all conditions/information set in this RFP Document by way of revision, deletion, updating or annulment through issuance of appropriate addendum as NMRC may deem fit without assigning any reason thereof.

NMRC reserves the right to accept or reject any or all Bids without giving any reasons thereof. NMRC will not entertain or be liable for any claim for costs and expenses in relation to the preparation of the Bid/s to be submitted in terms of this RFP Document.

Glossary

a) —**Addendum / Amendment**‖ means any written amendment / addendum /corrigendum to this RFP, from time to time issued by NMRC to the prospective bidders

b) **"Agreement"** means the Contract Agreement to be executed between NMRC and the Selected Bidder

c) **"Applicable Laws"** means all the laws including local, state, national or other laws, brought into force and effect by Govt. of India, State Governments, local bodies, statutory agencies and any other, and rules / regulations / notifications issued by them from time to time. It also include judgments, decrees, injunctions, writs and orders of any court or judicial authority as may be in force and effected from time to time

d) **"Bidder"** or **"Tenderer"** means any entity which is a sole proprietorship firm, a partnership firm or a company, in title and assigns which is submitting its bid pursuant to RFP Documents

e) **"Bid Due Date" means** Bid Submission end date and time given in the E-tender

f) **"e-Bid Security / Earnest Money Deposit (EMD)"** means the refundable amount to be submitted by the Bidder along with RFP documents to NMRC

g) **"Performance Bank Guarantee/ Security Deposit"** means interest free amount to be deposited by the Contractor with NMRC as per terms and conditions of Contract Agreement as a security against the performance of the Contract agreement

h) **"NMRC"** means Noida Metro Rail Corporation Limited (or —Corporation‖ or —Purchaser‖ or —Employer‖)

i) **"Party"** means Contractor or Corporation (together they are called **"Parties"**)

j) **"Permits"** shall mean and include all applicable statutory, environmental or regulatory Contracts, authorization, permits, consents, approvals, registrations and franchises from concerned authorities

k) **"Re. or Rs. or INR"** means Indian Rupee

l) **"Revenue Operations Date (ROD)"** means the date of operation of Metro

m) **"Selected Bidder"** means the bidder who has been selected by NMRC, pursuant to the bidding process for award of Contract

n) —**Work**" means all the work specified or set forth and required in and by the said specifications, hereto annexed or to be implied there from or incidental thereto, or to be hereafter specified or required in such explanatory instructions and drawings (being in conformity with the said original specifications)

The words and expressions beginning with capital letters and defined in this document shall, unless repugnant to the context, have the meaning ascribed thereto hereinabove.

Data Sheet

1	Name of the Bid	RFP for Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida **Approximate Cost of Work = INR 2.87 crore**
2	Time-period of contract	6 Months
3	Method of selection	Cost Based Selection (Lowest –L1)
4	Bid Processing Fee	Rs. 23,600/- (Rupees Twenty Three Thousand Six Hundred Only) (GST) through RTGS/NEFT only payable in favour tro Rail Corporation Limited
5	Earnest Money Deposit (EMD)	Rs. 5.81 Lakh /- (Rupees Five Lakh Eighty One Thousand Only)

6	Bid System	Two Bid System (Technical and Financial)
7	Name of the Corporation and Official	Executive Director Noida Metro Rail Corporation, Block-III, 3rd Floor, Ganga Shopping Complex, Sector-29, Noida 201301 Email: nmrcnoida@gmail.com Website:www.nmrcmoida.com, http://etender.up.nic.in
8	Bid Validity Period	180 days
9	Bid Language	English
10	Bid Currency	INR
11	Key Dates	Schedule
(a)	Uploading of Bid	01/01/2019
(b)	Date of pre-bid meeting	04/01/2019 11:00 AM
(c)	Last Date of Bid Submission	08/01/2019 up to 1500 hrs (IST)
(d)	Date of Technical Bid Opening	09/01/2019, 1100 hrs (IST)
12	Consortium to be allowed	No
13	Account details	**For Bid Processing Fee & EMD** State Bank of India (04077) – Sector 18, Noida Gautam Budh Nagar, Uttar Pradesh - 201301 IFSC Code: SBIN0004077 **A/c No. 37707840592** **Noida Metro Rail Corporation Ltd.**

Content

1. Section 1: General Information

1.1. Background

a. Noida and Greater Noida are being developed as the satellite towns to New Delhi and more and more people from Delhi and other areas are shifting to these towns in search of fresh air, greenery and better infrastructure. There is a need of providing an efficient, reliable and comfortable transportation system for the population intending to settle in these towns and also the public coming to these areas for education, service and business.

b. Noida Metro Rail Corporation is a Special Purpose Vehicle (SPV) formed by Noida and Greater Noida Authorities for planning and executing urban transport projects in Noida, Greater Noida regions. The Corporation desires to provide a world-class Public Transportation System with state-of-the-art technology. As such, the overarching criterion for setting up of the Corporation is to help create an efficient, safe, reliable, economical and affordable public transport system.

c. An elevated metro line between Noida and Greater Noida is already under advanced stages of testing.

d. NMRC invites E-Bids for selection of Contractor for Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida

e. In this regard, the Corporation now invites the interested Bidder/s to submit their proposals as per provisions of this RFP Document.

f. NMRC will shortlist the Bidders on the basis of evaluation criteria mentioned in this RFP Document. On the basis of the minimum evaluation criteria, qualified Bidders will be shortlisted and Financial proposal of only qualified Bidders will be opened.

1.2. About Locations

The metro corridor is 29.7 km long in first phase and is known as Noida Greater Noida Metro Rail Corridor. It comprises 21 metro stations starting from Noida Sector 51 in Noida and ends up at Depot Station in Greater Noida. The map is in Appendix 1: Metro Alignment.

1.3. Communication

All communications should be addressed to -

Executive Director
Noida Metro Rail Corporation (NMRC) Limited
Block-III, 3rd Floor, Ganga Shopping Complex, Sector-29,
Noida -201301
District Gautam Budh Nagar, Uttar Pradesh

Email: nmrcnoida@gmail.com

2. Section 2: Terms of Reference

2.1. Scope of Work

a. The work covered in the tender includes below mentioned location

   Entrance and Hall (3rd Floor), Ganga Shopping Complex, Sector 29, Noida

b. The technical specifications is set forth in Section 6 of this RFP.

3. Section 3: Instructions to Bidders

3.1. General instructions

a. A Bidder is eligible to submit only one Tender for the Project. A Bidder applying shall not be entitled to submit another Tender, as the case may be. Any Bidder, which submits or participates in more than one tender/proposal would be disqualified.

b. The Bidder shall initiate, and actively pursue and involve itself in all investigations and enquiries, Corporation feedbacks, information, convening of and attendance at meetings, and in any other activities as are or may be necessary for producing high quality work as per the requirements.

c. The Bidder shall carry out the services in compliance with the provisions of this Agreement. Any and all changes necessary to ensure that the Bidder's documents conform to the intent and purpose set out in the Agreement, shall be made at the Bidder's own expense. The Bidder represents that it is a professional and experienced company providing services related to tender, and hereby agrees to bear full responsibility for the correctness and technical merit of the services performed.

d. Bidders shall be evaluated on the basis of the Evaluation Criteria specified in this document. Bidders shall be deemed to have understood and agreed that no explanation or justification for any aspect of the Selection Process will be given and that NMRC‘s decisions are without any right of appeal whatsoever.

e. Any entity which has been barred by the Central/State Government in India or by any entity controlled by them, from participating in any project, and the bar subsists as on the date of Bid, would not be eligible to submit an e - Bid.

f. An Bidder should have, during the last five years, neither failed to perform on any agreement, as evidenced by imposition of a penalty by an arbitral or judicial authority or a judicial pronouncement or arbitration award against the Bidder, nor been expelled from any project or agreement nor have had any agreement terminated for breach by such Bidder.

g. Bidders are encouraged to inform themselves fully about the assignment and the local conditions before submitting the e-Bid by paying a visit to the Corporation and/or by sending written queries to NMRC before the last date for receiving queries/clarifications.

h. NMRC shall not be liable for any omission, mistake or error on the part of the Bidder in respect of any of the above or on account of any matter or thing arising out of or concerning or relating to e-Bid or the Selection Process, including any error or mistake therein or in any information or data given by NMRC.

i. Any new taxes or any statutory variation [which comes into effect after the last date of submission of Bid on any item] during the contractual completion shall be to the Employer‘s account for which the Bidder shall furnish the documentary evidence in support of their claims. However, any increase in cost due to new taxes or change in existing taxes introduced during extended contractual period due to Bidder‘s fault shall be to his account.

j. The currency for the purpose of the Proposal shall be the Indian Rupee (INR).

3.1.1. Cost of Bid Document / e-Tender processing Fee

a. The tenderer shall bear all costs associated with the preparation and submission of its e-Bid and Noida Metro Rail Corporation Ltd. (—NMRC‖ or —the Corporation‖), will in no case be responsible or liable for these costs, regardless of the conduct or outcome of the e-Bid process.

b. This tender document is available on the web site http://etender.up.nic.in or on NMRC website (www.nmrcnoida.com) to enable the tenderers to view, download the e-Bid document and submit e-Bids online up to the last date and time mentioned in e-Tender notice/e-tender document

against this e-Tender. The tenderers shall have to pay cost of bid document/ eTender processing fee of as mentioned in **Data Sheet** through RTGS/NEFT only payable in favour of Noida Metro Rail Corporation Limited in the A/c No. mentioned in **Data Sheet**. The scanned copy of RTGS/NEFT receipt with transaction Id certified by the same bank must be enclosed along with the e-Bid. This cost of bid document/ e-Tender processing fee as mentioned in **Data Sheet** will be non-refundable. Tender without cost of bid document/ e-Tender processing fee in the prescribed form, will not be accepted.

3.1.2. Acknowledgement by Bidder

It shall be deemed that by submitting the e-Bid, the Bidder has:

a. made a complete and careful examination of the e-Bid;

b. received all relevant information requested from NMRC;

c. acknowledged and accepted the risk of inadequacy, error or mistake in the information provided in the e-Bid or furnished by or on behalf of NMRC;

d. satisfied itself about all matters, things and information, necessary and required for submitting an informed Application and performance of all of its obligations thereunder;

e. acknowledged that it does not have a Conflict of Interest; and

f. agreed to be bound by the undertaking provided by it under and in terms hereof.

3.1.3. Availability of Bid Document

This Bid document is available on the web site http://etender.up.nic.in and on Noida Metro website www.nmrcnoida.com to enable the Bidders to view, download the e-Bid document and submit e-Bids online up to the last date and time mentioned in e-Bidder notice/ e-Bid document. The Bidder`s shall have to pay e-Bid document fee and EMD as mentioned in Data sheet through RTGS/NEFT on addresses given in data sheet. The scanned copy of RTGS/NEFT with transaction ID certified by the same bank must be enclosed along with the e-Bid. This e-Bid document fee will be non-refundable. Bid without Bid fee in the prescribe form will not be accepted.

3.1.4. Clarifications of e-Bid

a. During evaluation of e-Bid, NMRC may, at its discretion, ask the Bidder for a clarification of his/her e-Bid. The request for clarification shall be in writing.

b. Any queries or request for additional information concerning this RFP shall be submitted in writing or by fax and e-mail to the Executive Director, NMRC only within seven days of issuance of tender. The envelopes/ communication shall clearly bear the following identification/ title: **"Queries/ Request for Additional Information: RFP for Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida ".** The responses will be posted to all such queries on the official Website www.nmrcnoida.com. NMRC reserves the right not to respond to any questions or provide any clarifications, in its sole discretion, and nothing in this Clause shall be taken or read as compelling or requiring NMRC to respond to any question or to provide any clarification.

c. In case the Bidder seeks for any queries, he shall send letter or e-mail to the correspondence address given in Data Sheet.

d. However, NMRC shall not entertain any correspondence from the Bidders during the period of eBid opening to selection of the successful Bidder. Any wrong practice shall be dealt in accordance with the Section of this e-Bid document under Fraud and Corrupt Practices.

3.1.5. Amendment of e-Bid Document

a. At any time prior to the deadline for submission of e-Bid, NMRC may, for any reason, whether at its on in iterative or in response to a clarification requested by a prospective Bidder, modify the e-Bid document by amendments. Such amendments shall be uploaded on the e-

procurement website http://etender.up.nic.in. The relevant clauses of the e-Bid document shall be treated as amended accordingly.

b. It shall be the sole responsibility of the prospective Bidder to check the web site http//etender.up.nic.in or NMRC's website www.nmrcnoida.com from time to time for any amendment in the e-Bid documents. In case of failure to get the amendments, if any, NMRC shall not be responsible for it.

c. In order to allow prospective e-Bids a reasonable time to take the amendment into account in preparing their e-Bids, NMRC, at the discretion, may extend the deadline for the submission of e-Bids. Such extensions shall be uploaded on the e-procurement website http://etender.up.nic.in or NMRC's website www.nmrcnoida.com.

3.2. Preparation and submission of Bids

3.2.1. Language of e-Bid

The e-Bid prepared by the Bidder, as well as all correspondence and documents relating to the e-Bid exchanged by the Bidder and NMRC shall be written in English language. Only English numerals shall be used in the e-Bid. The correspondence and documents in any other language must be accompanied by transcripts verified by the Embassy of Home Country or equivalent.

3.2.2. Documents constituting the e-Bid

The e-Bid prepared by the Bidder shall comprise the following components: a.

Technical e-Bid- Technical e-Bid will comprise of -

i. **Fee details -** Details of Bid processing fee and prescribed EMD

ii. **Eligibility details -** Includes copies of required documents in PDF format justifying that the Bidder is qualified to perform the contract if his/her bid is accepted and the Bidder has financial & technical capability necessary to perform the contract and meets the criteria outlined in the Qualification requirement and technical specification and fulfill all the conditions of the contract.

iii. **Technical evaluation -** Details of all documents needed for Technical evaluation as mentioned in this RFP

b. Financial e-Bid -

i. **Price bid –** Bill of Quantities in XLS format to be filled in after downloading from the eProcurement website for this e-tender. There shall be a single quote.

3.2.3. Documents establishing Bidder's Qualification

a. The Bidder shall furnish, as part of its technical e-Bid, documents establishing the Bidder's qualification to perform the contract if its e-Bid is accepted. The documentary evidence should be submitted by the Bidder electronically in the PDF format.

b. The documentary evidence of Bidder's qualification to perform the contract if its e-Bid is accepted shall be as per qualification requirements specified in e-Bid document.

3.2.4. E-Bid form

The Bidder shall complete the e-Bid form and the appropriate price schedule/BOQ furnished in the e-Bid document. Financial Quote shall comprise of the rate of Total Price for RFP for Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida in the Bid form in figures.

3.2.5. E-Bid Currency

Prices shall be quoted in Indian Rupees only.

3.2.6. Formats and Signing of e-Bid

a. The Bidder shall prepare one electronic copy of the technical e-Bid and financial e-Bid separately.

b. The e-Bid document shall be digitally signed, at the time of uploading, by the Bidder or a person or persons duly authorized to bind the Bidder to the contract. The later authorization shall be indicated by a scanned copy of written power-of attorney accompanying the e-Bid. All the pages/documents of the e-Bid that are to be uploaded shall be digitally signed by the person authorized to sign the e-Bid.

c. Bidders should provide all the information as per the RFP and in the specified formats. NMRC reserves the rights to reject any proposal that is not in the specified formats.

d. In case the Bidders intends to provide additional information for which specified space in the given format is not sufficient, it can be furnished in duly stamped and signed PDFs.

3.2.7. Deadline for submission of e-Bid

E-Bid (Technical and financial) must be submitted by the Bidder at e-procurement website http://etender.up.nic.in not later than the time specified on the prescribed date (as the server time displayed in the e-procurement website). NMRC may, at its discretion, extend this deadline for submission of e-Bid by amending the e-Bid document, in which case all rights and obligations of NMRC and Bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

3.2.8. Submission of e-Bid

a. The bid submission module of e-procurement website http://etender.up.nic.in enables the Bidders to submit the e-Bid online in response to this e-Bid published by NMRC.

b. Bid submission can be done only from the bid submission start date and time till the bid submission end date and time given in the e-Bid. Bidders should start the bid submission process well in advance so that they can submit their e-Bid in time.

c. The Bidder should submit their e-Bid considering the server time displayed in the e- procurement website. This server time is the time by which the e-Bid submission activity will be allowed till the permissible time on the last/end date of submission indicated in the e-Bid schedule.

d. Once the e-Bid submission date and time is over, the Bidders cannot submit their e-Bid. For delay in submission of e-Bid due to any reasons, the Bidders shall only be held responsible.

The Bidders have to follow the following instructions for submission of their e-Bid:

a. For participating in e-Bid through the e-Biding system it is necessary for the Bidders to be the registered users of the e-procurement website http://etender.up.nic.in. The Bidders must obtain a user login Id and password by registering themselves with U.P. Electronics Corporation Ltd., Lucknow if they have not done so previously for registration.

b. In addition to the normal registration, the Bidder has to register with his/her digital signature certificate (DSC) in the e-Biding system and subsequently he/she will be allowed to carry out his/her e-Bid submission activities. Registering the digital signature certificate (DSC) is a one-time activity. Before proceeding to register his/her DSC, the Bidder should first log on to the e-Biding system using the user login option on the home page with the login Id and password with which he/she has registered.

For successful registration of DSC on e-procurement website http://etender.up.nic.in the Bidder must ensure that he/she should possess class-2/class-3 DSC issued by any certifying authorities approved by controller of certifying authorities, Government of India, as the e-procurement website http://etender.up.nic.in is presently accepting DSC issued by these authorities only. The Bidder can obtain user login Id and perform DSC registration

exercise given above even before the e-Bid submission date starts. NMRC shall not be held responsible if the Bidder tries to submit his/her e-Bid at the moment before end date of submission but could not submit due to DSC registration problem.

c. The Bidder can search for active Bids through "search active tenders" link, select a Bid in which he/she is interested in and then move it to 'My Tenders' folder using the options available in the e-Bid submission menu. After selecting and the Bid, for which the Bidder intends to e-Bid, from "My tenders" folder, the Bidder can place his/her e-Bid by clicking "pay offline" option available at the end of the view Bid details form. Before this, the Bidder should download the e-Bid document and price schedule/bill of quantity (BOQ) and study them carefully. The Bidder should keep all the documents ready as per the requirements of e-Bid document in the PDF format except the price schedule /bill of quantity (BOQ) which should be in the XLS format (excel sheet).

d. After clicking the 'pay offline' option, the Bidder will be redirected to terms and conditions page. The Bidder should read the terms & conditions before proceeding to fill in the Bid fee and EMD offline payment details. After entering and saving the Bid fee and EMD details form so that "bid document preparation and submission" window appears to upload the documents as per technical (fee details, qualification details, e-Bid form and technical specification details) and financial (e-Bid form and price schedule/BOQ) schedules/packets given in the Bid details. The details of the RTGS/NEFT should tally with the details available in the scanned copy and the date entered during e-Bid submission time otherwise the e-Bid submitted will not be accepted.

e. Next the Bidder should upload the technical e-Bid documents for fee details (e-Bid fee and EMD), Qualification details. Before uploading, the Bidder has to select the relevant digital signature certificate. He may be prompted to enter the digital signature certificate password, if necessary. For uploading, the Bidder should click "browse" button against each document label in technical and financial schedules/packets and then upload the relevant PDF/XLS files already prepared and stored in the Bidder's computer. The required documents for each document label of technical (fee details, qualification details, e-Bid form and technical specification details) and financial (e-Bid form and price schedule/BOQ) schedules/packets can be clubbed together to make single different files for each label.

f. The Bidder should click "Encrypt" next for successfully encrypting and uploading of required documents. during the above process, the e-Bid document are digitally signed using the DSC of the Bidder and then the documents are encrypted/locked electronically with the DSC's of the bid openers to ensure that the e-Bid documents are protected, stored and opened by concerned bid openers only.

g. After successful submission of e-Bid document, a page giving the summary of e-Bid submission will be displayed confirming end of e-Bid submission process. The Bidder can take a printout of the bid summary using the "print" option available in the window as an acknowledgement for future reference.

h. NMRC reserves the right to cancel any or all e-Bids without assigning any reason.

3.2.9. Late e-Bid

a. Bids received by NMRC after the specified time on the Bid Due Date shall not be eligible for consideration and shall be summarily rejected.

b. The server time indicated in the bid management window on the e- procurement website http://etender.up.nic.in will be the time by which the e-Bid submission activity will be allowed till the permissible date and time scheduled in the e-Bid.

c. Once the e-Bid submission date and time is over, the Bidder cannot submit his/her e-Bid. Bidder has to start the bid submission well in advance so that the submission process passes off smoothly. The Bidder will only be held responsible if his/her e-Bid is not submitted in time due to any of his/her problems/faults, for whatsoever reason, during e-Bid submission process.

3.2.10. Withdrawal and resubmission of e-Bid

a. At any point of time, a Bidder can withdraw his/her e-Bid submitted online before the bid submission end date and time. For withdrawing the Bidder should first log in using his/her login id and password and subsequently by his/her digital signature certificate on the e-procurement website http://etender.up.nic.in. The Bidder should then select "My bids" option in the bid submission menu. The page listing all the bids submitted by the Bidder will be displayed. Click "View" to see the details of the bid to be withdrawn. After selecting the "bid withdrawal" option the Bidder has to click "Yes" to the message "Do you want to withdraw this bid?" displayed in the bid information window for the selected bid. The Bidder also has to enter the bid withdrawing reasons and upload the letter giving the reasons for withdrawing before clicking the "Submit" button. The Bidder has to confirm again by pressing "OK" button before finally withdrawing his/her selected e-Bid.

b. No e-Bid may be withdrawn in the interval between the deadline for submission of e-Bids and the expiration of period of e- bid validity. Withdrawal of an e-Bid during this interval may result in the forfeiting of Bidder's e-Bid security.

c. The Bidder can re-submit his/her e-Bid as when required till the e-Bid submission end date and time. The e-Bid submitted earlier will be replaced by the new one. The payment made by the Bidder earlier will be used for revised e-Bid and the new e-Bid submission summary generated after the successful submission of the revised e-Bid will considered for evaluation purposes. For resubmission, the Bidder should first log in using his/her login Id and password and subsequently by his/her digital signature certificate on the e-procurement website http://etender.up.nic.in. The Bidder should then select "My bids" option in the bid submission menu. The page listing all the bids submitted by the Bidder will be displayed. Click "View" to see the detail of the e-Bid to be resubmitted. After selecting the "bid resubmission" option, click "Encrypt & upload" to upload the revised e-Bids documents.

d. The Bidder can submit their revised e-Bids as many times as possible by uploading their e-Bid documents within the scheduled date & time for submission of e-Bids.

e. No e-Bid can be resubmitted subsequently after the deadline for submission of e-Bids.

3.2.11. NMRC's right to accept any e-Bid and to reject any or all e-Bids.

a. Notwithstanding anything contained in this e-Bid, NMRC reserves the right to accept or reject any Bid and to annul the Selection Process and reject all Bids, at any time without any liability or any obligation for such acceptance, rejection or annulment, and without assigning any reasons thereof.

b. NMRC reserves the right to reject any Bid if:

- At any time, a material misrepresentation is made or uncovered, or
- The Bidder does not provide, within the time specified by NMRC, the supplemental information sought by NMRC for evaluation of the e-Bid.

c. Such misrepresentation/ improper response may lead to the disqualification of the Bidder. If such disqualification /rejection occurs after the e-Bid have been opened and the highest ranking Bidder gets disqualified / rejected, then the NMRC reserves the right to consider the next best Bidder, or take any other measure as may be deemed fit in the sole discretion of NMRC, including annulment of the Selection Process.

3.2.12. Period of validity of e-Bid

a. e-Bid shall remain valid for 180 days after the date of e-Bid opening prescribed by NMRC. An eBid valid for a shorter period shall be rejected by NMRC as non-responsive.

b. In exceptional circumstances, NMRC may solicit the Bidder's consent to an extension of the period of e-Bid validity. The request and the response thereto shall be made in writing.

3.2.13. Correspondence with the Bidder

a. Save and except as provided in this e-Bid, NMRC shall not entertain any correspondence with any Bidder or its Technical Partners in relation to acceptance or rejection of any e-Bid.

b. Subject to Clause 3.4.5 no Bidders or its Technical Partners shall contact NMRC on any matter relating to his e-Bid from the time of Bid opening to the time contract is awarded.

c. Any effort by the Bidder or by its Technical Partners to influence NMRC in the Bid evaluation, Bid comparison or contract award decisions, may result in the rejection of his Bid.

3.3. Earnest Money Deposit

3.3.1. Earnest money deposit (EMD)

a. The tenderer shall furnish, as part of its e-Bid, an e-Bid security/ EMD as stated in Data Sheet in form of RTGS/NEFT only in favour Noida Metro Rail Corporation Limited in the A/c No. mentioned in **Data Sheet**. The scanned copy of RTGS/NEFT receipt of Security/ EMD with transaction Id certified by the same bank must be enclosed along with the e-Bid. Tender without Earnest Money in the prescribed form, will not be accepted.

b. Any e-Bid not secured in accordance with above shall be treated as non-responsive and rejected by NMRC.

c. Unsuccessful Bidder's EMD will be returned promptly as possible after opening of the Price Bid.

d. No interest will be paid by the Purchaser on the Earnest Money Deposit.

e. The successful Bidder's e-Bid EMD will be adjusted with Performance Bank Guarantee, if applicable, to be submitted by the Bidder upon signing the contract.

f. The EMD may be forfeited:

   i. If Bidder (a) withdraws its e-Bid during the period of e-Bid validity specified by the Bidder on the e- bid form: or (b) does not accept the correction of errors or (c) modifies its e-Bid price during the period of e-Bid validity specified by the Bidder on the form.

   ii. In case of a successful Bidder, if the Bidder fails to sign the contract with the Corporation.

3.4. Opening and Evaluation of Bids

3.4.1. Opening of technical e-Bid by NMRC

a. NMRC will open all technical e-Bids, in the presence of Bidder`s representatives who choose to attend on the prescribed date of opening at NMRC Office. The Bidder's representatives who are present shall sign a register evidencing their attendance. In the event of the specified date e-Bid opening being declared a holiday for the Corporation, the e –bids shall be opened at the appointed time and place on the next working day.

b. The Bidder who is participating in e-Bid should ensure that the RTGS/NEFT of Bid Processing Fee and EMD must be submitted in the prescribed account of NMRC within the duration (strictly within opening & closing date and time of individual e-Bid) of the work as mentioned in Bid notice, otherwise, in any case, e-Bid shall be rejected.

c. The Bidders names and the presence or absence of requisite e-Bid security and such other details as NMRC at its discretion may consider appropriate, will be announced at the opening.

3.4.2. Opening of financial e-Bid

a. After evaluation of technical e-Bid, through the evaluation committee NMRC shall notify those Bidders whose technical e-Bids were considered non-responsive to the conditions of the contract

and not meeting the technical specifications and qualification requirements indicating that their financial e-Bids will not be opened.

b. NMRC will simultaneously notify the Bidders, whose technical e-Bids were considered acceptable to the Corporation. The notification may sent by e-mail provided by Bidder.

c. The financial e-Bids of technically qualified Bidders shall be opened in the presence of technically qualified bidders who choose to attend. The date and time for opening of financial bids will be communicated to the technically qualified Bidders subsequently after completion of technical bids evaluation through e-mail provided by the Bidder. The name of Bidders, percentage price quoted for various items etc. will be announced at the meeting.

3.4.3. Correction of Errors

a. Financial Bids determined to be responsive will be checked by NMRC for any arithmetic errors. Where there is a discrepancy between the rate quoted in the Financial Bid, in figures and in words, the amount in words will prevail over the amounts in figures, to the extent of such discrepancy.

b. The amount stated in the Financial Bid will be adjusted by NMRC in accordance with the above procedure for the correction of errors and shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected quoted rate of e-Bid, his e-Bid will be rejected, and his Bid Security shall be liable for forfeiture in accordance with Clause 3.3.1f

3.4.4. Examination of e-Bid document

a. The NMRC will examine the e-Bid to determine if:

   i. They are complete;

   ii. They meet all the conditions of the contract;

   iii. The required e-Bid Processing fee, EMD and other required documents have been furnished;

   iv. The documents have been properly digitally signed; and

   v. The e-Bids are in order.

b. Any e-Bid or e-Bids not fulfilling these requirements shall be rejected.

3.4.5. Contacting NMRC

a. No Bidder shall contact NMRC on any matter relating to his/her e-Bid, from the time of the e-Bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of NMRC, he/she can do so in writing.

b. Any effort by a Bidder to influence NMRC in its decisions on e-Bid evaluation, e- bid comparison or contract award may result in rejection of the Bidder's e-Bid.

c. In the event of any information furnished by the Bidder is found false or fabricated, the minimum punishment shall be debarring /blacklisting from Noida Metro works and legal proceeding can also be initiated. EMD of such bidders will be forfeited.

3.4.6. Confidentiality

a. Information relating to the examination, clarification, evaluation, and recommendation for the Bidders shall not be disclosed to any person who is not officially concerned with the process or is not a retained professional advisor advising NMRC in relation to or matters arising out of, or concerning the Bidding Process. Any effort by a Bidder to exert undue or unfair influence in the

process of examination, clarification, evaluation and comparison of Proposal shall result in outright rejection of the offer, made by the said Bidder.

b. NMRC shall treat all information, submitted as part of Bid, in confidence and shall require all those who have access to such material to treat the same in confidence. NMRC may not divulge any such information unless it is directed to do so by any statutory entity that has the power under law to require its disclosure or is to enforce or assert any right or privilege of the statutory entity and/ or NMRC or as may be required by law or in connection with any legal process.

3.5. Award of Contract

3.5.1. Award Criteria

a. NMRC will award the contract as per evaluation criteria stated in the RFP Document.

b. NMRC will award the contract to the successful Bidder whose bid has been determined to be responsive to all the conditions of the contract and meeting the eligibility requirement of the bidding document.

3.5.2. Notice of Award (NOA)

a. Prior to the expiration of the period of e-Bid validity, NMRC will notify the successful Bidder in writing, by letter/e-mail/fax, that its e-Bid has been accepted.

b. The acceptance of NOA will constitute the formation of the contract.

3.5.3. Contract

a. This contract is for the supply, install, commissioning, training and maintenance of the equipment of the description, specifications and drawings, and in the quantities set forth in the contract on the date or dates specified therein. All equipment must be brand new and unused. Unpacking/seal opening has to be done in presence of NMRC.

b. The whole contract is to be executed in the most approved, substantial and workmanship manner, to the entire satisfaction of the Purchaser or his nominee, who, both personally and may his deputies, shall have full power, at every stage of progress, to inspect the equipment at such times as he may deem fit and to reject any of the equipment which he may disapprove.

3.5.4. Signing of contract

At the same time as NMRC notifies the successful Bidder that it‘s e-Bid has been accepted, the successful Bidder shall have to sign the contract agreement with relevant document as mentioned in the RFP. The agreement draft along with other related terms and conditions will be same as furnished in this e-Bid. Any refusal will not be allowed. The Bidder need not download and submit in hard copies of these documents.

3.5.5. NMRC’s right to accept any e-Bid and to reject any or all e-Bids

NMRC reserves the right to accept or reject any e-Bid, and to annul the e-Bid process and reject all eBids at any time prior to contract award, without thereby incurring any liability to the affected tenderer or tenderers.

4. Section 4: Qualification, Evaluation and Selection Process

4.1. Eligibility Criteria

The Bidder‘s competence and capability is proposed to be established by the following parameters. The Bidder should meet all the criteria given in this section.

a. The Bidder should be Sole proprietorship/ partnership firm/ public limited company/ private limited company.

b. The Bidder should have successfully completed in India during last **7 (seven) years** period ending last day of month previous to the one in which the bids are invited with Govt./ Semi Govt./ PSU only should be either of the following:

i. One order of similar nature of value not less than **Rs. 2.33 crore** (Rupees Two crore Thirty Three Lakh only) or ii. Two orders of similar nature of value not less than **Rs. 1.75 crore** (Rupees One crore Seventy Five lakh only) each or iii. Three orders of similar nature of value not less than **Rs. 1.17 crore** (Rupees One crore Seventeen lakh only) each

Definition of Similar Works – Experience in only building construction inclusive of civil work, Electrical work and HVAC, Firefighting work and landscaping work will be acceptable.

c. The Bidder should submit the solvency certificate issued by Nationalized / Scheduled bank (issued within a period of minimum six months) and it should not be less than **Rs. 1.17 crore** (Rupees One crore Seventeen lakh only)

d. The Bidder should have minimum **average annual turnover** from construction works of **Rs. 2.33 crore** (Rupees Two crore Thirty Three Lakh only) in the last 3 (three) Financial Years **(20152016, 2016-17, 2017-18)** preceding the Bid Due Date.

e. The Bidder should have positive profit before tax in the last 3 (three) Financial Years (2015-2016, 2016-17, 2017-18) preceding Bid Due Date.

f. The Bidder requires to provide proof of employment of technical staff, which will consist of a declaration by the Bidder as perForm 10: General Guidelines for Fixing Requirement of Technical Staff for Work.

g. The Bidder shall submit affidavit duly verified by Notary for having arrangement of required machinery, tools & plants, centering & shuttering, etc.

The minimum requirement of T&P possessed by the firm shall be as follows:

S.No.	**Particulars**	**Quantity**
1	Road Roller	NIL
2	Vibratory Road Roller	NIL
3	Truck/ Tipper	1
4	Water Tanker	1
5	Water Pumps	1
S.No.	**Particulars**	**Quantity**
6	Hot Mix Plant & Paver (Hiring of hot mix plant shall not be permitted in case the cost of DBM/ BM/ BC/ SDC work is more than one crore. Bidder will have to submit the purchase bill of plant as a proof). The bituminous work of DBM/ BM/ BC/ SDC will have to be done by hot mix plant and paver only.	NIL

7	Excavator	NIL
8	Concrete Mixture with hopper	1
9	Vibrator	
a	Needle Vibrator	1
b	Surface Vibrator	1
10	Concrete Batch Mix Plant of Capacity 15 Cum/Hr.	NIL

h. The Bidder shall submit the Character certificate issued by District Magistrate in the names of partners in case it is partnership firm, proprietor, in case it is proprietorship firm, directors in case it is company.

i. The Bidder should submit the notarized affidavit that the bidder has not been blacklisted by any state/ central government/ organization in last 7 (seven) financial years.

NMRC, if required, may seek clarifications from bidders during the technical evaluation. The Bidder shall also furnish the following:

a. For above criteria 4.1a
   i. Statutory proof of existence as the legal entity
   ii. Power of attorney as inForm 8: Power of Attorney
   iii. Memorandum and Articles of Association showing the objectives of the company/ firm (as per applicability)

b. For above criteria 4.1b

   i. A statement as in Form 4: Work Experience with documentary proof

c. For above criteria 4.1c
   i. Solvency certificate should be issued within a period of minimum 6 months of nationalized/ Schedule Bank. In case it is issued more than 6 months, it should be revalidated after 6 months

   In case of firm, proof of solvency of the bidder will consist of a certificate signed by the District Magistrate or Manager of the Bank as per Form 9: Banker‘s Solvency Certificate regarding the cash assets of the bidder.

   In case of company, the proof of the company solvency will be its last balance sheet audited and certificate by the Chartered Accountant or certificate/ reference of a Bank.

d. For above criteria 4.1d and 4.1e
   i. Form 5: Financial Capability Details

   ii. A copy of the Annual Reports (Profit and Loss Account and Balance Sheet) for the last 3 (three) Financial Years of Bidder

   A copy of the Audited balance sheets and Profit and Loss Statements for the last 3 (three) financial years.

   In case the Financial Statements for the latest financial year are not audited and therefore the Bidder cannot make it available, the Bidder shall give an undertaking to this effect and the statutory auditor/charted accountant shall certify the same. In such a case, the Bidder shall provide the Audited Financial Statements for 2 (two) years preceding the year for

which the Audited Financial Statement is not being provided. Also, pertaining to latest financial year, the bidder shall submit an affidavit certifying that ―The Annual Accounts have not been audited so far. We are submitting the CA certified provisional accounts, which shall be substantiated by the Audited Accounts, when prepared.‖

iii. A self-attested copy of current valid ITR

iv. A self-attested copy of PAN, GST registration

e. For above criteria 4.1f
   i. Form 10: General Guidelines for Fixing Requirement of Technical Staff for Work

f. For above criteria 4.1g
   i. Form 11: Proforma for Equipment available

g. For above criteria 4.1i ii. Form 7: Undertaking - 1

4.2. Compliance with Technical Specifications

The equipment offered by the bidders must comply with the stipulated technical specifications as mentioned in the tender documents.

4.3. Information of the Technical and Financial Proposal

a. The Bidder satisfying technical and financial eligibility criteria under Clause 4.1 shall be considered as technically and financially qualified.

b. The financial proposal of only technically qualified Bidders shall be opened for evaluation.

c. The Bidder with the lowest quoted price for ―**Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida "** in the financial quote (L1 bidder) shall be selected for the award of contract.

4.4. Selection of Bidder

After the above evaluation process, the Technically Qualified Bidder, who is declared as L1 (lowest quoted price) may be declared as the selected Bidder (―Selected Bidder‖) for the Project.

a. In case, two or more technically qualified bidders quote the same percentage in the Bid, and become Lowest (i.e. L-1), then the tender would be awarded to the bidder who has the highest / higher Average Annual Turnover from ‗Similar Works' (as per Minimum Eligibility Criteria defined in Section 4 under ―Definition of Similar Work‖) during the last 3 years ending on the last day of the month preceding the month in which the tender has been floated.

b. Prior to the expiry of the period of bid validity, NMRC will notify the successful bidder in writing, either through Notice of Award (NOA), that his bid has been accepted.

c. The NOA would be sent in duplicate to the successful bidder, who will return one copy to NMRC duly acknowledged, signed and stamped by the authorized signatory of the bidder, as an unconditional acceptance of the NOA, within 10 (ten) days from the date of issue of NOA.

d. No correspondence will be entertained by NMRC from the unsuccessful bidders.

4.5. Notice of Award and Execution of Contract Agreement

a. NMRC will notify the Successful Bidder by a NOA that its bid has been accepted.

b. The Selected Bidder shall, within 10 (ten) days of the receipt of the NOA, sign and return the duplicate copy of the NOA in acknowledgement thereof along with letter of acceptance of NOA. In the event, the duplicate copy of the NOA duly signed by the Selected Bidder and letter of acceptance of NOA is not received by the stipulated date, NMRC may, unless it consents to

extension of time for submission thereof, appropriate the Bid Security of such Bidder as mutually agreed genuine pre-estimated loss and damage suffered by NMRC on account of failure of the Selected Bidder to acknowledge the NOA.

c. The Successful Bidder shall execute the Contract Agreement within 30 (thirty) days of the letter of acceptance of NOA or such extended period as may be decided by the Corporation.

d. Failure of the Successful Bidder to comply with the requirement of acknowledgement of NOA shall constitute sufficient grounds for the annulment of the NOA, and forfeiture of the bid security.

4.6. Performance Bank Guarantee / Security Deposit

a. Contractor has to deposit additional performance guarantee/ Security in the shape of FDR/ CDR/ Bank Guarantee/ NSC in case rate quoted below of Bill of Quantity (BOQ) at 0.5% per one percent up to 10% below rate and 1% per one percent on rate quoted beyond 10% below rate, valid for the complete contract period by the Contractor before entering in to the contract bond.

b. A Contract agreement will have to be signed by the Contractor at his cost on proper stamp paper. Without performance guarantee by Contractor, Contract agreement shall not be signed.

c. NMRC reserves the right for deduction of NMRC dues from Contractor‘s Performance Bank Guarantee/ Security Deposit (interest free) for – Any penalty imposed by NMRC for violation of any terms and conditions of agreement committed by the Contractor.

   i. Any amount which NMRC becomes liable to the Government/Third party due to any default of the Contractor or any of his director/ employees/ representatives/ servant/ agent, etc.

   ii. Any payment/ fine made under the order/judgment of any court/consumer forum or law enforcing Contractor or any person duly empowered in his behalf.

   iii. Any outstanding payment/ claims of NMRC remained due after completion of relevant actions as per agreement.

d. Once the amount under above Clause is debited, the Contractor shall replenish the Security Deposit/ Performance Bank Guarantee to the extent the amount is debited within 15 days period, failing which, it shall be treated as Contractor Event of Default and will entitle NMRC to deal with the matter as per the provisions of RFP and Contract Agreement.

4.7. Contract during Proposal Evaluation

a. Proposals shall be deemed to be under consideration immediately after they are opened and until such time NMRC makes official intimation of award/ rejection to the Bidders. While the Proposals are under consideration, Bidders and/ or their representatives or other interested parties are advised to refrain from contacting by any means, NMRC and/ or their employees/ representatives on matters related to the Proposals under consideration till the time Contract is awarded.

b. Any effort by a Bidder to influence NMRC in its decisions on e-Bid evaluation, e-Bid comparison or contract award may result in rejection of the Bidder‘s e-Bid.

c. In the event of any information furnished by the Contractor is found false or fabricated the minimum punishment shall be debarred/ blacklisting and the legal proceeding may also be initiated.

d. If the Bidder wishes to bring additional information to the notice of NMRC, he/she can do so in writing. All correspondence/ enquiry should be submitted to the following in writing by fax/ post/courier:

Executive Director
Noida Metro Rail Corporation (NMRC) Limited
Block-III, 3rd Floor, Ganga Shopping Complex, Sector-29,
Noida -201301

District Gautam Budh Nagar, Uttar Pradesh
Email: nmrcnoida@gmail.com

e. No interpretation, revision, or other communication from NMRC regarding this solicitation is valid unless in writing and signed by the competent authority from NMRC.

4.8. Other Instruction

a. Canvassing in connection with the tenders is strictly prohibited and the tenders, submitted by Bidder, who resort to canvassing, are liable to be rejected. EMD will be forfeited of those tenders who will be found non serious and if it is felt by the tender committee that the Bidders submitted their tender only to influence the tendering process.

b. On acceptance of the tender, the name of the accredited representative of the Contractor, who would be responsible for taking instructions from the NMRC or the official deputed by NMRC, shall be communicated to the NMRC or the official deputed by NMRC in writing.

5. Section 5: Special Conditions of Contract (SCC)

5.1. Conditions Governing the Contract

The special conditions of contract contained herein shall be supplemented to the general conditions of the contract and in event of any conflict or inconsistency between them; Special conditions of the contract will supersede the General conditions of the contract.

a. The Bidders are advised before bidding to see carefully the site of work & study architectural & structural drawings for the buildings/ roads to be constructed under the scope of this tender.

b. In giving their rates, the Bidders should take into account all fluctuations of market construction rates of materials, as no claim shall be entertained on this account during the acceptance of the tender and the currency of the contract.

c. The tendered rates shall be for all completed items of the work and shall include all quarry royalties, testing, screening, tools & plants, railways freight, carriage of materials to site, stacking, removal charge of any rejected material, etc. labour cess and all other taxes in force from time to time.

d. Within fifteen days of the signing of Agreement, the contractor shall have to notify in writing the name of his two authorized representatives one of them will always be available at the site of work to receive the orders / instructions by Engineer in charge and the other for issue of materials and other miscellaneous works. The contractor shall be fully responsible for the orders / instructions received by his representatives regarding quality, progress and materials from the Engineer-in-charge or any higher officer of NMRC.

e. Contractor shall have to make their own arrangement of water and electricity for construction work at site. All the building material for the work shall be arranged by the contractor at his own cost.

f. The contractor shall be fully responsible for setting out the works and for the correctness of the positions, levels, dimensions and alignments strictly according to the plan / architectural and structural drawings (shall be provided without any charge) and all necessary instruments, pegs poles and other material required for the purpose, failing which the contractor will be penalized as applicable.

g. A Cement consumption register shall be maintained at the site by the department for material brought by contractor as per CPWD Manual/Specification. The contractor or his authorized representative / agent shall have to sign the register daily in token of the consumption of material consumed daily at work site.

h. The contractor (in self) shall give sufficient supervision to the work using his best skill and attention. He shall provide necessary qualified staff to supervise the execution of the work. The contractor or a competent authorized agent or representative should be got approved in writing by the Engineer-incharge (whose approval at any time can be withdrawn or changed) for supervising the work and to receive directions and instructions from Engineer-in-charge of the work on the behalf of the contractor. The supervisory staff of the contractor will not be changed without the approval of Engineer-in-charge.

i. The contractor shall be responsible for the damage to any property or any injury to person whatsoever caused by him or anybody in his employment or caused in consequence of his work. He will indemnify and keep the Government un-indemnified against all claims, demands, proceedings, charges and expenses and compensation, whatsoever, in respect of the or in relation to any such injuries or damages. The contractor shall take all necessary precautions for the safety of his employees on the

work site and shall comply with all applicable provisions of safety law and building codes to prevent accident or injuries to person on the work site.

j. The contractor shall keep at his own, whole of the excavated area free from water; however, if excavation is filled with water the contractor shall provide all pumping equipment temporary drain and such cuts / excavation shall be made good at the completion of work at his own cost.

k. The contractor shall at all times keep the premise free from accumulated waste material or rubbish caused by his employees on the work and on completion of the work he shall clear away whole site from such material and fill up the borrow pits / cuts dug by him. He will leave whole of the site and work clear in a workman like. Nothing extra shall be paid to contractor for this clearing up.

l. The contractor shall maintain and keep the area in agreed sanitary condition for the use of men engaged in the work by him and shall remove and clear all structures etc. which may have been setup by the contractor for accommodating his staff / labour on the completion of work to the satisfaction of the Engineer in charge.

m. All the material and workmanship and its working procedure shall be strictly as per specification of described in the contract and in case not covered in the contract then in accordance with the Engineer in charge / ISI code. Instructions shall be issued from time to time to tests the material as the Engineer in charge may direct at places of manufacture, at the work site. Contractor shall provide conveyance, labour and material required for examining, measuring and testing for the work and quality of material used. Contractor shall supply sample of the material get them approved before using in the work. The cost of such, like conveyance, labour and material provide for testing purpose and for examining the work and for proper completion of the same shall be borne by the contractor and no extra payment shall be made for the same. In addition to above, the contractor shall establish a field laboratory to carry out day to day tests of all material at his own cost. The contractor shall submit a list of the all the laboratory equipment's, quality control Engineer of the contractor who will work under direction and control of Engineer-in-charge.

n. The contractors shall have to make their own arrangements of water for construction work, for temporary accommodations for the office staff and for the labourers' residence at the site of work. The water should be fit for drinking. In case the water is supplied by the department, the contractor shall have to bear charges at rates fixed by the authority.

o. The contractor will have to follow all existing rules and regulations of the Government & labour department or as amended from time to time regarding the labour employed by him without entitling him for any extra claim on this account.

p. Works to be open to inspection : All works under or in course of execution or executed in pursuance of the contractor shall at time be opened to the inspection and supervision of the Engineer-in-charge and other corporation‘s officials and the contractor shall present at work site at all times during the inspection and usual working hours. At all other times, notice for the inspection of site by the Engineer-in-charge or any other official is given to the contractor, contractor should either himself be present to receive orders and instructions of a responsible authorized agent be present for the purpose. Orders given to the contractor's agent shall be considered to have the same force as if they had been given to the contractor himself. The contractor shall also provide all facilities necessary for inspection of the work by the Engineer-in-charge or other officials for which no payment shall be made to the contractor.

q. The contractor will arrange the water for consolidation of stone ballast and compaction of earth and nothing extra will be paid for the same.

r. The contractor is to stack the metal at the road berms first according to the size of template with stack number as decided by the Engineer in charge and no metal shall be stocked on road embankment. The metal shall be only allowed to spread for consolidation after recording measurements and taken into road metal account register.

s. The quantity measured in stacks shall be final & binding on the contractor and no claim will be entertained thereafter.

t. A deduction of 7.5% (for voids) shall be made after stack measurements of stone aggregate for payment.

u. Deduction shall be made for earthwork in filling without compaction up to 95% proctor density as per C.P.W.D. specification.

v. The stone ballast and grit will be blue textured and free from soft stone pieces. The size / gauge of the ballast shall be as per detailed specification of C.P.W.D.

w. In case of earth work in filling is being done in layers of 20cm thickness, the compaction must be done with heavy machinery such as road roller of 8 tonne or above capacity at the optimum moisture content. The dry density must be achieved to the extent or not less than 95% of proctor's density. In this area when the compaction is achieved to the desired density no deduction shall be made from the measured cubical content.

x. In case of earth work in filling is being done in layers of 20cm thickness, the compaction must be done with heavy machinery such as road roller of 8 tonne or above capacity at the optimum moisture content. The dry density must be achieved to the extent or not less than 95% of proctor's density. In this area when the compaction is achieved to the desired density no deduction shall be made from the measured cubical content.

In case of patries (shoulder of road) the compaction should be done with road roller of 8 tonne capacity. However, 95% proctor's density at optimum moisture contents is not necessary. The deduction of this area must be made 10% on the measured cubical content of compacted earth.

y. For cement storage at work site, double lock system will have to be followed.

z. The dust emissions from the construction site should be completely controlled and all precautions taken in that behalf.

aa. Every worker working on the construction site and involved in loading, unloading and carriage of construction material and construction debris shall be provided with mask to prevent inhalation of dust particles.

bb. Every Project proponent shall be under obligation to provide all medical help, investigation and treatment to the workers involved in the construction of building and carry of construction material and debris relatable to dust emission.

cc. All builders/owners should take appropriate measures and strictly comply with by fixing sprinklers and creations of green air barriers on construction site.

dd. Compulsory use of wet-jet in grinding and stone cutting.

ee. Wind breaking walls around construction site and proper maintenance of greenbelt should be answered.

ff. All builders shall ensure that C&D waste is transported and disposed to the C&D waste site only and due record in that behalf shall be maintained by the builders and transporters.

gg. It shall be the responsibility of every builder that all the construction material and debris shall be carried in the trucks or other vehicles which are fully covered and protected so as to ensure that the construction debris or the construction material does not get dispersed into the air or atmosphere, in any form whatsoever.

hh. The vehicles carrying construction material and construction debris of any kind should be cleared before it is permitted to ply on the road after unloading of such material.

ii. The entry and exit points design is very important as it should not disturb the existing traffic. This clear demarcation of entry and exit points is important.

jj. Fitness certification is a statutory requirement for commercial vehicles and public transport vehicles. Periodicity for certification is once in a Year.

kk. Pollution-Under-Control (PUC) certificates are required to be obtained every three months for all categories of vehicles and Life of vehicle should be inspected to avoid further air pollution.

ll. Viable emission control technologies exist to reduce diesel exhaust emissions designed to control particulate matter (PM) should be installed/used such as Diesel oxidation catalysts (DOCs), Diesel particulate filters (DPFs), Exhaust gas recirculation (EGR), Selective catalytic reduction (SCR), Lean NOx catalysts (LNCs), Lean Nox traps (LNTs).

mm. The Vehicles carrying garbage should be covered with polythene/Tripal otherwise contractor will be suitably penalized. nn. Garbage, dry leafs burning is a serious offence. If it is found at site, respective contractor will be suitably penalized.

5.2. Time for Completion of Work

The Work needs to be completed within a period of **6 (six) months** from the date of acceptance of NOA.

6. Section 6: Technical Specifications

6.1. Specifications for Civil Works

6.1.1. Puf Panel Insulated Roof

Fixing of Puff Panel Roofing shell be constructed of 60+30 mm thick PUF (Poly Urethane Foam) & density of 40 + 2 kg/m3 laminated with 0.5mm Pre-coated GI outside and 0.5mm inside of roof. Over the perlin over main trusss as / structure. The roofing panel shall have overlap joinery systems. The top coat of the panels shall preferably be AWT color & Bottom AWT. Complete in all respect.

6.1.2. Polycarbonate Sheet

Fixing of Polycarbonate sheet (4 mm thick) inserted in 50 mm Aluminium Extrusion standard tightened with EPDM RUBBER GASKET with SDS screws and fasteners over steel structure as / drawing complete in all respect. Transparent silicone 789 shall be used to fill the joints.

6.1.3. Terrace Garden

Laying of grass Selection No 1 over Growing Medium Soil (200 mm thick) over 0.8 to 0.9 mm thick Geotextile of GSM 140 (+-5%) of Quality Code ST-14 over Drainage Board 8 to 9 mm thick of GSM 400 (+-5%) Quality Code DB-04 over 1 mm APP membrane over RCC slab complete in all respect.

6.2. Specifications of Plumbing works

6.2.1. Section-I: Internal Rain Water Drainage

6.2.1.1. Scope of Work

The scope of work under this section comprises the supply, installation, testing and commissioning of internal drainage services. This shall consist of furnishing all labor, materials, equipment and appliances necessary and required to completely install rainwater pipes and fittings as required by the drawings, and given in the schedule of quantities.

6.2.1.2. Piping System

Rain water pipes in shafts, ducts and in concealed areas etc. shall consist of uPVC pipes confirming to IS to IS 4985 (class C) & fittings as called for.

The rain water pipes shall be circular with a minimum diameter of 150mm. Pipes shall be fixed by means of galvanized steel clamps in two sections, bolted together, built into the walls, wedged and neatly jointed as directed and approved by the Owner‘s site representative. All bends, branches, swan neck and other parts shall conform to the requirement and standards as described for the pipes. Pipes shall be rested against the walls on suitable wooden cradles. Local authority regulations applicable to the installations shall be strictly followed.

Access doors for fittings and clean outs shall be so located that they are easily accessible for repair and maintenance. Any access panel required in the civil structure, false ceiling or marble cladding etc. shall be clearly reported to the Owner in the form of shop drawings so that other agencies are instructed to provide the same.

6.2.1.3. Piping Materials UPVC

Pipes and Fittings

1. The pipes shall be round and shall be supplied in straight lengths with socketed ends. The internal and external surfaces of pipes shall be smooth, clean, and free from grooving‘s and other defects. The ends shall be cleanly cut and square with the axis of the pipe. The pipes shall be designed by external diameter and shall conform to IS: 4985-1981. The pipes shall be of ClassIII; 6 kg/sqm pressure rating.
2. Fittings shall be of the same make as that of pipes, injection moulded and shall conform to Indian Standard.

Supports

3. UPVC pipes require supports at close intervals. Recommended support spacing for unplasticised PVC pipes is 1400 mm for pipes 50 mm dia and above. Pipes shall be aligned properly before fixing them on the wooden plugs with clamps. Even if the wooden plugs are fixed using a plumb line, pipe shall also be checked for its alignment before clamping, piping shall be properly supported on, or suspended from clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchors, clamps and hangers and be responsible for their structural sufficiency. Pipe supports shall be primer coated with rust preventive paint.

Laying and Jointing

4. The pipes shall be laid and clamped to wooden plugs fixed above the surface of the wall. Alternatively plastic clamps of suitable designs shall be preferred. Provision shall be made for the effect of thermal movement by not gripping or disturbing the pipe at supports between the anchors for suspended pipes. The supports shall allow the repeated movements to take place without abrasion.
5. Jointing for UPVC pipes shall be made by means of solvent cement for horizontal lines and ‗O' rubber ring for vertical line. The type of joint shall be used as per site conditions / direction of the Owner's site representative. Where UPVC pipes are to be used for rain water pipes, the pipe shall be finished with GI adopter for insertion in the RCC slab for a water proof joint complete as directed by Owner's site representative.
6. All open terraces shall be drained by rain water down takes.
7. Rainwater down takes are separate and independent of the soil and waste system and will discharge into the underground storm water drainage system of the complex.
8. Rainwater in open area shall be collected in catch basins and connected to the Storm Water manhole.

6.2.1.4. Testing

1. Testing shall be done in accordance with IS: 1172 and IS: 5329 except as may be modified herein under.
2. Before use at site all uPVC pipes shall be tested by filling up with water for at least 30 minutes. After filling, pipes shall be struck with a hammer and inspected for blow holes and cracks. All defective pipes shall be rejected and removed from the site within 48 hours. Pipes with minor sweating may be accepted at the discretion of the Project Manager.
3. Entire drainage system shall be tested for water tightness and smoke tightness during and after completion of the installation. No portion of the system shall remain untested. Contractor must have adequate number of expandable rubber bellow plugs, manometers, smoke testing machines, pipe and fitting work tests. All materials obtained and used on site must have manufacturer's hydraulic test certificate for each batch of materials used on the site.

6.2.2. Section-II: External Drainage (Storm Water Disposal)

6.2.2.1. Scope of Work

The scope under this section comprises the supply, installation, testing and commissioning of external storm drainage services.

The drainage system shall include: Storm water drainage, earth works for excavation, disposal, backfilling and compaction, pipe lines, manholes, catch basins and connections to the existing municipal storm water drain.

All materials shall be new and of quality conforming to specifications and subject to the approval of the Owner‘s site representative.

Drainage lines and open drains shall be laid to the required gradients and profiles. All drainage work shall be done in accordance with the local municipal bye-laws.

Contractor shall obtain necessary approval and permission for the drainage system from the municipal or any other competent authority.

Location of all manholes, etc. shall be got confirmed by the Project Manager before the actual execution of work at site. As far as possible, no drains shall be laid in the middle of road unless otherwise specifically shown on the drawings or directed by the Project Manager in writing.

All materials shall be rust proofed; materials in direct or indirect contact shall be compatible to prevent electrolytic or chemical (bimetallic) corrosion.

6.2.2.2. Pipe and Drain Trench

Alignment

1. The storm water drainage pipes shall be carefully laid to levels and gradients shown in the plans and sections but subject to modifications as shall be approved by the Architects from time to time to meet the requirements of the works. Great care shall be taken to prevent sand etc. from entering the pipes. The pipes between two manholes shall be laid truly in straight lines without vertical or horizontal undulations. The body of the pipes shall rest on an even bed in the trench for its length and places shall be excavated to receive collar for the purpose of jointing. No deviations from the lines, depths of cuttings or gradients as called for on the drawings shall be permitted without the written approval of the Architect. All pipes shall be laid at least 45cms below the finished ground level or as called for on the drawings. Trenches Setting Out
2. The contractor shall set out all trenches including widths, manholes, chambers and such other works to true grades and alignments as called for. All trenches shall be laid to true grade and in straight lines and as shown on the drawings. Trench Excavation
3. The trenches for the pipes shall be excavated with bottoms formed to level and gradients as shown on the drawings. In soft and filled in ground, the Project Manager may require the trenches to be excavated to a greater depth than the shown on the drawings and to fill up such additional excavation with concrete (1:4:8) consolidated to bring the excavation to the required levels as shown on the drawings.
4. All excavations shall be properly protected where necessary by suitable timbering, piling and sheeting as approved by the Project Manager. All timbering and sheeting when withdrawn shall be done gradually to avoid falls. All cavities be adequately filled and consolidated. No blasting shall be allowed without prior approval in writing from the Architect. It shall be carried out under thorough and competent supervision, with the written permission of the appropriate authorities taking full precautions connected with the blasting operations. All excavated earth shall be kept clear of the trenches to a distance equal to 75 cms. Trench Back Filling
5. Refilling of the trenches shall not be commenced until the length of pipes therein has been tested and approved. All timbering which may be withdrawn safely shall be removed as filling proceeds. Where the pipes are unprotected by concrete hunching, selected fine material shall be carefully hand-packed around the lower half of the pipes so as to buttress them to the sides of the trench. Width of trench
6. Recommended width of trenches at the bottom shall be as follows:-

100 mm dia pipe	55 cms
150 mm dia pipe	55 cms
225-250 cms dia pipe	60 cms

7. Maximum width of the bed concrete shall also be as above. Should the contractor excavate the trenches to width greater that specified above, no additional payment will be admissible for widths greater than specified. The contractor shall also fill the cement concrete for the pipe to the full width of the excavated trench with any extra cost.

6.2.2.3. Piping Material

RCC pipes

1. All pipes shall be centrifugally spun RCC pipes NP3. Pipes shall be true and straight with uniform bore throughout. Cracked, warped pipes shall not be used on the work. All pipes shall be tested by the manufacturer and the Contractor shall produce, prior to use on site, a certificate to that effect from the manufacturer. The pipes shall be with or without reinforcement as required and of the class as specified. These shall conform to IS: 458-1971.
2. All pipes shall be true to shape, straight, perfectly sound and free from cracks and flaws. The external and internal surface of the pipes shall be smooth and hard. The pipes shall be free from defects resulting from imperfect grading of the aggregate mixing or moulding. Pipe Laying
3. RCC spun pipes shall be laid on cement concrete bed of cradles as specified and shown on the detailed drawings. The cradles may be precast and sufficiently cured to prevent cracks and breakage in handling. The invert of the cradles shall be left 12 mm below the invert level of the pipe and properly placed on the soil to prevent any disturbance. The pipe shall then be placed on `the bed concrete or cradles and set for the line and gradient by means of sight rails and boning rods, etc. Cradles or concrete bed may be omitted, if directed by the Project Manager. Pipe Jointing
4. Semi flexible type collar joint. Hemp rope soaked in neat cement wash shall be passed round the joint and inserted in it by means of caulking tool. More skein of yarn shall be added and rammed home. Cement mortar with one part of cement and two part of sand and with minimum water content but on no account soft or sloppy, shall be carefully inserted, punched and caulked into the collar and more cement mortar added until the space of the collar has been filled completely with tightly caulked mortar. Provision of rubber sealing ring in the collar joint shall also be made. The joint shall then be finished off neatly outside the socket at an angle of 45 deg.
5. The joint shall be cured for at least seven days. Refilling at joints will be permitted only on satisfactory completion of curing period.
6. Cement Concrete for Pipe Supports:
    a. Pipes may be supported on brick masonry or precast RCC or in situ cradles. Cradles shall be as shown on the drawings.

		up to 1.5 m depth	**up to 3 m depth**	**beyond 3 m depth**
1	RCC or SW in sub soil water	All round (1:3:6)	In Haunches (1:3:6)	In Haunches (1:3:6)

    b. Unless otherwise directed by the Project Manager cement concrete for bed, all round or in haunches shall be as follows:
    c. Pipes in loose soil or above ground shall be supported on brick or stone masonry pillars as shown on the drawings.
7. Measurement:
    a. Measurement for excavation of pipes trenches shall be made per linear meter.
    b. Trenches shall be measurement between outside walls of manholes at top and the depth shall be the average depth between the two ends to the nearest cm. The rate quoted shall be for a depth up to 1.5 metre or as identified in the Schedule of Quantities.

c. RCC pipes shall be measured for length of the pipe line per linear meter. Length between manholes shall be recorded from inside of one manhole or inside of other manhole.

6.2.2.4. Construction of Manhole

1. Based on approved drawings, manholes are to be constructed, the excavation, filling back and ramming, disposal of surplus earth, preparation of bottom and sides etc. shall be carried out as described earlier under trench excavation.
2. The manhole shall be built on a base concrete 1:3:6 of 150mm thickness for manholes up to 1500mm depth and 250mm thickness for manholes from 1500 to 2500mm depth and 300mm thickness manholes of depth greater than 2500mm. Reinforcement as shown shall be provided in the base slabs.
3. The walls shall be of brick work of thickness as shown in drawings built in cement mortar 1:5. The joints of brick work shall be raked and plastered internally in cement mortar 1:3 and finish with a coat of neat cement, external plaster shall be rough plaster in 1:3, PCC benching & semicircular channels of the same diameter as the pipes shall be provided and finished with neat cement coating.
4. All manholes shall be provided with poly propylene coated steel reinforced foot rest. The polypropylene shall confirm to ASTM D-4101 specification, injection moulded around 12 mm dia IS-1786 grade FE-415 steel reinforcing bar. These rungs shall be set at 30cms interval in two vertical runs at 380mm apart horizontally. The top rung shall be 450mm below the manhole cover.

Measurements

5. Manhole shall be measured in numbers as indicated in the Bill of Quantity. The depth of manhole shall be measured from invert of channel to the top of manhole cover.
6. Manhole with depth greater than specified under the main item shall be paid for under `Extra Depth' and shall include all items as given for manholes depth will be measured to the nearest cm. Depth of the manholes shall be measured from top of the manhole cover to bottom of channel. The following shall be inclusive in the quoted para of manhole
7. Bed concrete Brick work.
    a. Inside & Outside Plastering
    b. R C C top slab, benching and channelling including drop connections.
    c. Supply and fix foot rests.
    d. De-watering of chambers
    e. Excavation, refilling, necessary de-watering and disposing off surplus soil
    f. Cost of angle frame and embedding the frame in concrete bed. Road Gully

Chambers

8. The chamber shall be of brick masonry with Bricks of class designation 75 in cement mortar 1:5 (1cement : 5 coarse sand) and shall have a PCC/SFRC/D.I dully grating with frame fixed in 150mm thick cement concrete 1:2:4 (1cement : 2 coarse sand : 4 hard stone ballast 20mm nominal size) on top. The size of the chamber shall be taken as the clear internal dimension as specified in the schedule of quantities. The brick walls on the top of the bed concrete 1:4:8 (1cement: 4 coarse sand: 8 hard stone ballast 40mm and down gauge) of the chamber shall be plastered with 12mm thick cement plaster 1:3 (1cement: 3 coarse sand) internally and externally and finished with a floating coat of neat cement. The excavation shall be done true to dimension and level shown in the drawing.

6.2.2.5. Testing

1. All storm water lines shall be carefully tested for water tightness by means of water pressure maintained for not less than 30 minutes. Testing shall be carried out from manhole to manhole. All pipes shall be subject to a test pressure of 1.5 meter head of water. The test pressure will however, not exceed 6 meters head at any point. The pipes shall be plugged preferably with standard design plugs or with rubber plugs on both sides, the upper end shall, however, be connected to a pipe for filling with water and getting the required head poured at one time.
2. Sewer lines shall be tested for straightness by:
    a. The contractor shall give a smoke test to the drain and sewer at his own expense and charges, if directed by the Owner‘s site representative.
    b. A test register shall be maintained which shall be signed and dated by contractor and Owner‘s site representative.
    c. Means of a mirror at one end a lamp at the other end. If the pipe is straight the full circle of light will be seen otherwise obstructions or deviations will be apparent.
    d. Inserting a smooth ball 12 mm less than the internal diameter of the pipe. In the absence of obstructions such as yarn or mortar projecting at the joints the ball shall roll down the invert of the pipe and emerge at the lower end.

6.3. Specifications of Electrical and other works

6.3.1. Section - I Lt Distribution Boards

6.3.1.1. Scope

This section covers specification of Distribution Boards (DBs) suitable for operation on 415 V 3 Phase 4 wire 50 Hz supply feeding final lighting and power sub circuits.

6.3.1.2. Standards And Codes

Updated and current Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 2003, Indian Electricity Rules 1956, National Building Code 1997, National Electric Code 1985, Code of Practice for Fire Safety of Building (general): General Principal and Fire Grading – IS 1641 - 1988 as amended up to date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

- Miniature Circuit Breakers for AC circuits IS 8828 : 1996 & IEC 947
- Residual current operated Circuit Breakers IS 12640 : 1988
- Low voltage switchgear and control gear Part II IS 13947 : 1993
- Degrees of Protection provided by enclosures for low voltage switchgear IS 2147 : 1962
- Code of Practice for installation and maintenance of switchgear not exceeding 1000 volts IS 10118 : 1982
- General requirements for switchgear and control gear for voltages not exceeding 1000 volts IS 4237 : 1982
- Specification for Low-voltages switchgear & control gear assembly (Part-1,2 & 3) IS 8623 : 1993

6.3.1.3. Miniature Circuit Breakers

The MCB's shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz system. The MCB's shall have a rupturing capacity of 10 KA Ics. The MCB's shall have inverse time delayed thermal overload and instantaneous magnetic short circuit protection. The MCB time current characteristic shall coordinate with PVC cable characteristic. Watt loss per pole of MCB shall confirm to value specified in IS 8828 – 1996. Type test certificates from independent authorities shall be submitted with the tender or before approval.

6.3.1.4. Residual Current Circuit Breakers (RCCB)

RCCBs shall comply with IS 12640 – 1988 and shall be of the current operated type. The RCCB shall be designed to trip within 20 mili sec at a current sensitivity of 30 mA. The RCCB shall be of 2 pole construction for single phase and 4 pole construction for 3 phase. All RCCB shall be complete with test buttons. RCCB shall have a minimum life expectancy of 10,000 operations.

6.3.1.5. Distribution Boards

1. DBs shall be wall mounting, recessed/surfaced type, totally enclosed,16 SWG, dust and vermin proof and shall comprise of miniature isolator, miniature circuit breakers, earth leakage circuit breakers, busbars, neutral link etc. as required, of ratings detailed in the schedule of quantities.
2. DBs shall be double door type. Access to the wiring shall be possible without removing the outer hinged door. The door shall be earthed with insulated copper braded flexible wires.
3. Components forming a part of the DBs shall comply with the relevant Standards and Codes of the Bureau of Indian Standards.
4. As a general practice only prewired MCB type DBs shall be used, on account of their superior technical features, compared to conventional DBs, which don‘t allow for proper wiring space and wiring terminations. Rewirable fuse type DBs shall not be used.
5. Prewired DBs shall have following features :
    a. Recess / surface type with integral loose wire box
    b. Phase / neutral / earth terminal blocks for termination of incoming and outgoing wires.
    c. Din channel for mounting MCBs
    d. Arrangement for mounting incomer MCB/RCCB/RCBO/MCCB as required. e. Copper bus bar
    f. Earthing terminals
    g. Wiring from MCB‘s to phase terminal block
    h. Interconnection between terminal block/incoming switch / bus bar/neutral terminal block / earth terminal connector with specified size of FRLS pre-insulated copper conductor cable duly fitted with copper lugs / thimbles
    i. Terminal blocks should be suitable for termination of conductor / cable of required size but minimum rated cross section of the terminal blocks should be 6 sq mm
    j. Terminal block shall be made of flame retardant polymide material
    k. Colored terminal blocks and FRLS wires for easy identification of RYB phases, neutral and earth
    l. Prewired DB shall be provided with a detachable cassette for safe removal of MCBs, RCCBs. Terminal connectors from the DB without loosening the internal cable connections of phase and neutral circuits (This is an optional feature).
    m. The prewired DB shall have peel able poly layer on the cover for protection from cement, plaster, paints etc. during the construction period.

n. Detachable plate with Knock out holes shall be provided at the top/bottom of board. Complete board shall be factory fabricated and prewired in factory ready for installation at site. The box and cover shall be fabricated from 1.6 mm sheet steel, properly pretreated, phosphatized with powder coated finish.

Where specified it shall be out double door construction provided with hinged cover in the front.

6.3.1.6. Name Plates and Labels

Suitable engraved white on black name plates and identification labels of metal for all Switchboards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

6.3.2. Section - II Cable Tray/Raceway

6.3.2.1. Cable Trays

1. **Ladder type Cable tray** – for Power Cables only
    a. Cable trays shall be ladder type fabricated out of mild steel/slotted angles and flats of required width as per design.
    b. Bends shall be prefabricated. The cable tray shall be hot dip galvanized or primed and painted with powder coating as asked for in BoQ or as approved by Owner/Consultant.
    c. The minimum weight of the zinc coating shall be 460 gm/sq.m and minimum thickness of coating shall not be less than 75 microns.
2. **Perforated Cable tray** – for Cables for Low current service only
    a. The perforated cable trays are fabricated out of 2.0 mm thick CRCA sheet steel having minimum 50mm depth or as called for in BOQ, hot dip galvanized or epoxy coated of approved shade.
    b. Perforations are maximum 10mm spaced at maximum 20mm distance. The cables shall be tied with the cable tray with nylon strip/aluminium clamps/M.S. clamps as per requirements.
    c. Suitable provision shall be made where a tray crosses expansion joints. The width of the tray shall allow for a suitable separation between cables the design shall allow for adequate bending radius for the sizes of cables.
    d. No sharp bend to be allowed in cable tray. Joints between sections shall be bolted.
    e. The tray shall be suspended from the surface of the concrete slab by means of approved steel hangers spaced at a distance of not more than 125cms. Suitable bushes shall be provided where cables pass through apertures in the tray.
    f. Cables must be securely fixed to the tray with clamps or cable ties. In routing necessary barrier and spacing shall be maintained for cables of different voltages in case they lie side by side.
    g. Telephone cables shall cross the power cables only at about right angle and these two shall not run in close proximity.
    h. Full details of the tray shall be approved by the Consultant/Site Engineer before fabrication. Earth continuity shall be maintained between each section of cable tray and each total run of tray shall be effectively bonded to the nearest earth continuity 0 conductor.
    i. All nuts and bolts used shall be of galvanised steel.
    j. Depending on the size of cable trays space of 20-33% has to be maintained for future expansion.

k. Cable tray is manufactured to comply with the specifications of National Electrical Code (NEC) and National Electrical Manufacturer's Association (NEMA).

6.3.2.2. Hot Dip Galvanizing Process for Mild Steel Used for Earthing, Cable Trays or Junction Boxes for Electrical Installation.

GENERAL REQUIREMENTS

1. Quality of Zinc: Zinc to be used shall conform to minimum Zn 98 grade as per requirement of IS: 209-1992.
2. Coating Requirement
    a. Minimum weight of zinc coating for mild steel flats with thickness up to 6 mm in accordance with IS:6745-1972 shall be 400 g/sqm.
    b. The weight of coating expressed in grams per square metre shall be calculated by dividing the total weight of Zinc by total area (both sides) of the coated surface.
    c. The Zinc coating shall be uniform, smooth and free from imperfections as flux, ash and dross inclusions, bare patches black spots, pimples, lumpiness, runs, rust stains bulky white deposits, blisters.
    d. Mild steel flats / wires shall undergo a process of degreasing pickling in acid, cold rinsing and then galvanizing.

6.3.2.3. Fire Retardant Cable Paint & Fire Barrier:

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

Fire retardant cable Paint

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

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

Fire Barrier sheet for floor and wall sealing

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

6.3.2.4. Testing of Cables

1. Cables shall be tested at works for the following tests before being dispatched to site by the project team.
    a. Insulation Resistance Test.
    b. Continuity resistance test.
    c. Sheathing continuity test.
    d. Earth test.(in armoured cables)
    e. Hi Pot Test.
2. Test shall also be conducted at site for insulation between phases and between phase and earth for each length of cable, before and after jointing. On completion of cable laying work, the following tests shall be conducted in the presence of the Owner‘s site representative.
    a. Insulation Resistance Test(Sectional and overall)
    b. Continuity resistance test.
    c. Sheathing continuity test.
    d. Earth test.
3. All tests shall be carried out in accordance with relevant Standard Code of Practice and Electricity Rules. The Contractor shall provide necessary instruments, equipment and labour for conducting the above tests and shall bear all expenses in connection with such tests. All tests shall be carried out in the presence of the Owner‘s site representative.

6.3.2.5. Floor Cable Trunking

1. General
    a. Trunking and fittings shall comply with BS 2989 or Indian Standard of IS277 with a GI coating thickness of 275GSM.
    b. Trunking shall be top accessed. Inverted trunking is not acceptable.
    c. All multi-compartment trunking systems shall maintain the stated segregation throughout, including all accessories.
    d. Trunking shall be manufactured using pregalvanised sheet steel. Trunking shall be spot welded & arc welded throughout its length for better impact resistant and to prevent concrete seepage during installation. The trunking shall normally be supplied in 2500mm lengths with a material thickness of 1.6mm. Lengths of trunking, shall be coupled together by means of joint sleeves, made of pre galvanized GI with 275 GSM GI coating. At each joint in the trunking, continuity shall be maintained by means of copper links, not less than 25 x 3 mm to achieve an acceptable earth loop impedance level in compliance with BS 2989, fixed with brass nuts, bolts and serrated washers. Removal of any lid no matter how it is fitted shall not affect the earth continuity of the trunking. LSZH copper cable link with cable lugs may be used, if the proper connection method is provided to avoid long term corrosion and electrolytic action. The LSZH cable shall have an equivalent cross sectional area to the copper links. Bonding link shall be fixed on external surfaces.
    e. Manufacturer‘s standard fittings shall be used for all connections and changes of direction. All vertical bends, Crossover boxes, access outlets, and junction boxes shall be of the same manufacturer as the trunking. Trunking shall not be cut or bent to form bends, flanges or attachments. Gusset bends shall be used wherever necessary to provide sufficient bending radius for the cables. Site fabricated items shall not be accepted.

2. The minimum size shall be 50mm by 40mm with single compartment. The maximum recommended size for the trunking is up to 300mm by 40mm with triple compartments.
3. All inside edges of trunking shall be smooth and provision shall be made to prevent abrasion at bends.
4. Cable retaining straps supplied by the trunking manufacturer shall be fitted at intervals not exceeding 1m. Where trunking passes through walls, floors and ceilings, proprietary fire barriers shall be installed in the trunking. The fire barrier shall have a rating not less than that of the original construction of the opening.
5. Trunking shall be adequately supported throughout its length. Trunking support and channel shall be quick-fixing type and shall be such as to space the trunking a minimum of 13mm from any part of the wall or bulkhead.
6. A minimum of two fixings shall be provided between joints in the trunking except where the distance between is less than the maximum spacing.
7. Where trunking is cut or drilled, the cut edges of the trunking shall be smoothed to prevent abrasion of the cables and shall be painted with anti-corrosion paint like aluminium coating, to the same colour as the adjacent surfaces, such painting to be carried out as the work proceeds. In no circumstances will rough screw edges and nuts be allowed in the interior of the trunking.
8. Flush or buried trunking and under floor metal ducts shall comply with BS 2989.
9. The space factor for cables installed in trunking shall not exceed 35% as per IEE regulations.
10. All lengths of vertical run trunking in excess of 3000mm shall contain cable supports made of insulating, non-hygroscopic, non-combustible material. The spacing between such supports shall not exceed 1800mm.
11. An additional support shall be provided at the top of all vertical runs exceeding 3000mm, to support the weight of the cable and distribute the cables within the trunking to prevent undue compression of the installation.
12. Where trunking crosses expansion joints, a trunking fitting shall be used which shall allow for expansion and maintain earth continuity.
13. Suitable cutout on underfloor trunking at ticket barriers shall be provided to suit Automatic Fare Collection System Contractor‘s requirement. The cutout shall not have a sharp edge or abrasive effect on cables. The location and route for the cutout and under floor trunking shall be according to Working Drawings.
14. Trunking installed externally shall be manufactured from galvanized sheet steel in accordance with BS 2989 protection Class 3, or other international standards. Trunking installed internally shall be of Class 2.
15. Partitions or dividers shall be of the same material and finish as the trunking. The method of fixing shall not cause any long-term corrosion or electrolytic action.
16. Connections to multiple boxes, switchgear and distribution boards shall be made with multi compartment vertical access boxes. Expansion joints in long continuous runs shall be provided as recommended by the manufacturer.

6.3.2.6. Access Outlets

1. Access Outlets are made of very high quality materials to withstand heavy load and corrosion.
2. Manufactured from high-pressure die cast material for strength &durability.

3. The trap frame & trap are made of flame retardant Engineering Plastic - ABS & Polyamide ratchet for strength & durability.
4. The Trap Frame can be easily removed by pulling either one of the Nylon Bars to detach & remove the unit for servicing or installation of accessories to save installation & servicing time.
5. Patented screw less ratchet bar level adjusting system to match with screed / floor height. The trap lid is self-adjustable to any floor finish thickness.
6. Trap cover must be reinforced with a 2.5mm thick pre-galvanized steel plate to provide rigidity & added strength. Trap lid to have a screw less knob-hinged design for quick mounting on to the frame requiring minimum maintenance.
7. The Trap cover must have 8 mm recessed for installation of carpet and tiles.
8. Trap trim design to protect carpet from damages and give the floor area added aesthetics.
9. Trap lid should be made of Electrostatic Polyester Epoxy Coating to provide excellent and enhanced protection on visible parts against chemical or saline corrosion.
10. Strong and durable trap lifting handle on the trap cover is made of similar color material and has special design for easy lifting, even with large fingers.
11. Cables are guided by Cable Retainers through generous cable outlet which open automatically and lock into position when cables are present.
12. Trap cover of Access box should be retained by Cable Grommets with high quality durable foam to prevent the cable damage from exit position & also prevent ingress of dust when closed.
13. Access Outlet should carry service plates for providing services i.e.: Power, Data & Telecom. The Access outlets must accommodate to have three compartments to run Mains Voltage & Extra Low Voltage cables.
14. The system must have Positive Double Earthing connections.
15. Earth wire connector should be provided in all the boxes, and complies with the requirement of current IEE regulation.
16. Access outlets are tested to a load bearing of 2 tons on the trap lid for heavy traffic areas
17. Four side blanks are made with removable perforations to suit ducts installation.
18. Standards & Approvals – The system must comply with the relevant specification & IEC 61084 standards.

6.3.2.7. Crossovers/Junction Boxes

1. Cross Overs/Junction boxes are made of very high quality materials to withstand heavy load and corrosion.
2. Manufactured from high-pressure die cast material for strength &durability.
3. The trap lid is self-adjustable to any floor finish thickness using the levelling screws on all the four corners.
4. The Trap cover is made of 2.5mm thick pre-galvanized steel plate to provide rigidity & added strength.
5. The Trap covers to have flexibility for quick mounting on to the base box requiring minimum maintenance.
6. The Trap cover must have 8mm recessed for installation of carpet and tiles.

7. The Flyover units, trap frame and traps should be made of Electrostatic Polyester Epoxy Coating to provide excellent and enhanced protection on visible parts against chemical or saline corrosion.
8. The Cross Overs should carry fly-over made of Electrostatic Polyester Epoxy Coating for cables passage to ensure segregation of service
9. Crossovers are tested to a load bearing of 3.6 tons on the trap lid for heavy traffic areas. The Cross Overs should have provision to Power, Data & Telecom services.
10. The system must accommodate to run Mains Voltage & Extra Low Voltage cables.
11. The trap cover screws must be made from Stainless Steel for extra protection.
12. The system must have Positive Double Earthing connections.
13. Earth wire connector should be provided in all the boxes, and complies with the requirement of current IEE regulation.
14. The complete system must have excellent protection against rust.
15. Four side blanks are made with removable perforations to suit ducts installation of up to 38-mm height.
16. The one-piece base frame design ensures minimum openings to prevent concrete seepage into the box during casting of concrete or screeding.
17. Standards & Approvals – The system must comply with the relevant specification & IEC 61084 standards.

6.3.2.8. Vertical Access Boxes

1. Vertical access boxes are made of very high quality materials to withstand heavy load and corrosion.
2. Vertical access boxes facilitate the connectivity of floor raceways to the equipment on the wall like the distribution boards, so the product should be designed as —Lǁ shaped
3. The Vertical access boxes should have provision to carry Power, Data & Telecom services
4. The vertical access boxes should have the duct entry knockouts of up to 38mm and also provision for carrying the conduits to the wall
5. The vertical access boxes are made of electrostatic polyester epoxy coating to prevent the rust accumulation.

6.3.3. Section III- Light Fixtures

6.3.3.1. Light Fittings

Technical parameters to be followed by all light fixtures unless specified in:

1. Efficacy of the fixture must be minimum 95 lumen/Watt,
2. Service Life of the fixture should be minimum 50,000 burning hours,
3. The LED used should be of following makes- Nichia/Cree/Philips-Lumiled/Osram/Sharp/Seoul.
4. The CRI of the fixture should be minimum 80 for indoor applications and 70 for outdoor applications,
5. The THD should be less than 10%.
6. The housing of the indoor fixtures should be extruded aluminum/standard alloy housing,
7. For outdoor fixtures the housing shall be of high pressure die cast aluminium housing,

8. The IP category should be IP20 or higher for indoor applications and IP65 or higher for outdoor applications,
9. The Surge Protection to be provided conforming to relevant IS standards/IEC 61643-II Class-2 & EN 61643-II Type-2,
10. The manufacturers name/logo should be engraved/embossed on the housing/body or Name/Logo on aluminium plate labels or Name/logo printed on housing/body,
11. The warranty period on complete luminaire including driver/control gear, LED, all accessories should be 5 years from the actual date of completion of work.
12. The Power factor should be 0.95 or higher,
13. The total power consumption of the fitting should not be more than 110% of rated capacity of LED light.

6.3.3.2. Lighting Fixtures & Accessories

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

1. **Scope:** Scope of work under this section shall include inspection at suppliers/ manufacturer's premises at site up to satisfaction of Engineer-in-Charge or authorized representative. Light fixture can only be supplied after getting approval from Engineer-in Charge. Supplying at site, receiving at site, safe storage, transportation from point of storage to point of erection, erection and commissioning of light fittings, fixtures and accessories including all necessary supports, brackets, down rods and painting etc. as required as per .
2. **Standards:** The lighting and their associated accessories such as reflectors, housings, drivers etc., shall comply with the latest applicable standards, more specifically the following:

   Light Fittings-General Requirements:
3. Fittings shall be designed for continuous trouble free operation under atmospheric conditions without reduction in lamp life or without deterioration of materials and internal wiring. Degree of protection of enclosure shall be IP-65 or above and as per for outdoor fittings.
4. Fittings shall be so designed as to facilitate easy maintenance including cleaning, replacement of drivers.
5. Outdoor type fittings shall be provided with weather proof junction boxes (IP-55) and IP-54 Control gear boxes. All Medium bay and high bay fixtures shall be supplied with junction box as per site requirement and as per.
6. Each fitting shall have a terminal block suitable for loop-out connection by 1100 V PVC insulated copper conductor wires up to 4 sq.mm. The internal wiring should be completed by the manufacturer by means of standard copper wire and terminated on the terminal block.
7. All hardware used in the fitting shall be suitably plated or anodized and passivated.
8. Earthing: Each lighting fitting shall be provided with an earthing terminal. All metal or metal enclosed parts of the housing shall be bonded and connected to the earthing terminal so as to ensure satisfactory earthing continuity throughout the fixture.
9. Painting/Finish: All surfaces of the fittings shall be thoroughly cleaned and degreased and the fittings shall be free from scale, rust, sharp-edges, and burns.
10. The housing shall be powder coated as required and as per. The surface shall be scratch resistant.

11. Luminaire shall have dual optics with primary optics distribution of 120 degree or higher and secondary optics as per site/ requirement.
12. Luminaire shall be designed to operate continuously for minimum 12 hours without deviation in the output parameters.
13. All the luminaires shall have LM-79, LM-80 and certificates from NABL accredited lab.
14. Luminaires and driver both shall be BIS certified individually.
15. Metal used in BODY of lighting fixtures shall be not less than 22 SWG or heavier if so required to comply with specification of standards. Sheet steel reflectors shall have a thickness of not less than 20 SWG. The metal parts of the fixtures shall be completely free from burns and tool marks. Solder shall not be used as mechanical fastening device on any part of the fixture.
16. Luminaire should be covered with suitable Glass or diffuser with High Transitivity. Outdoor luminaire shall be with clear toughened glass or clear polycarbonate cover.
17. Heat sink used should be extruded Aluminium or Pressure Die-Cast Aluminium having high conductivity preferably ADC 12 or LM 6.
18. Lighting fixtures and accessories shall be designed for continuous trouble free operation of minimum of 12 hrs under diverse atmospheric conditions without deterioration of materials.
19. Gasket: An extruded silicon loop gasket shall be provided in the lantern body to ensure a weather proof seal between the cover and the metal housing to exclude the entry of dust, water, insects, etc. Luminaire should conform to degree of protection of IP 65 or above. Felt gasket will not be accepted. This point is applicable only for highbays and outdoor type lumianires.
20. The fixture shall be suitable to work under following ambient conditions. Maximum ambient air temperature of 45 deg C (For Indoor products) Maximum ambient air temperature of 35 deg C (For Outdoor products).
21. For outdoor type luminaire it shall consist of separate optical and control gear compartment. Driver should be easily replaceable in the field conditions. Driver shall be integrated inside the luminaire and should not be kept behind light engine.
22. The Luminaire should be compliant to the following standards:
    - IEC 60529 - Classification of degree of protections provided by enclosures
    - 16103(Part 1) : 2012 Led Modules for General Lighting- Safety Requirements
    - 16103(Part 2) : 2012 Led Modules For General Lighting Part 2 Performance Requirements
    - IS 16107 (Part 1) : 2012 Luminaires Performance Part 1 General Requirements
    - IS 16107 (Part 2) : 2012 Luminaires Performance Part 2 Particular Requirements Section 1 LED Luminaire
    - IS 16104 : 2012 - d.c. or a.c. Supplied Electronic Control Gear for LED Modules - Performance Requirements
    - IS 16105 : 2012 Method of Measurement of Lumen Maintenance of Solid - State Light LED Sources
    - IS 16106 : 2012 - Method of Electrical and Photometric Measurements of Solid-State Lighting (Led) Products
    - IES LM-79-08 - Electrical and Photometric Measurements for Solid State Lighting Products

- IES LM-80-08 - Measuring Lumen Maintenance of LED Light Sources
- IEC 60598-1 - General requirement and tests
- IEC 60068-2-38 - Specification for Permitted Humidity Test
- Immunity to interference EN 61547
- Safety EN 60928 / IEC 928 / IS 13021 (Part I)
- Performance EN 60929 / IEC 929 / IS 13021 (Part II)
- Vibrations & Bump tests IEC 68-2-6 FC / IEC 9001
- Quality Standard ISO 9001
- Environmental Standard ISO 14001
- DC Operation EN 60924
- Emergency Lighting Operation VDE 0108

6.3.3.3. Electronic driver

Driver shall comply with the following:

- EN 6 1000-3-2 – Harmonics
- EMI – Confirming to CISPR-15
- No Stroboscopic Effect
- Constant Wattage / Light output between 240 V ± 10%.
- Circuit protection for surge current and inrush current.
- Short circuits, open lamp protection
- RFI < 30 MHz EN 55015
- RFI > 30 MHz EN 55022
- Total Harmonic Distortion (THD)≦ 10%
- Output voltage ripple should be within 3%
- Full Load Efficiency of the driver ≥ 90%
- Current waveform should meet EN 61000-3-2

6.3.3.4. Installation

1. Fixtures shall be installed at mounting heights as detailed on the Drawings or as instructed on site by the Engineer.
2. Pendent fixtures within the same room or area, shall be installed plumb and at a uniform height from the finished floor. Adjustment of height shall be made during installation. Flush mounted recessed fixtures, shall be installed so as to completely eliminate leakage of light within the fixture and between the fixture and adjacent finish.
3. Fixtures mounted outlet boxes shall be rigidly secured to a fixture stud in the outlet box. Hickeys or extension pieces shall be installed where required to facilitate proper installation.
4. Fixtures located on the exterior of the building shall be installed with non-ferrous metal screws finished to match the fixtures.
5. All light fittings shall be supported with appropriate fixing accessories such as clips, supporting brackets, suspension sets, nuts, washers, screws etc. for their proper installation on different types of ceiling panels. Suspension sets shall be of adjustable type suitable to carry the weight of the lighting fittings unless otherwise stated or indicated on drawings.

6.3.3.5. Testing of installations:

After all lighting fixtures are installed and are connected their respective switches, test all fixtures to ensure operation on their correct switch in the presence of the Engineer. All un-operating fixtures or ones connected to the wrong or inconveniently located switch shall be correctly connected as directed by the Engineer.

6.3.4. Section IV- Earthing

6.3.4.1. Scope

1. This section covers specifications for earthing systems comprising of earth electrodes, earth leads and loop earthing conductors.
2. Separate earthing systems shall be provided for neutral earthing (of transformers and generators) and body earthing.
3. All the non-current carrying metal parts of electrical installations including metal conduits, trunkings, cable armour, switchboards, DBs, light fittings and all other non-current carrying parts made of metal shall be bonded together and connected by means of specified earthing conductors to an efficient earthing system.
4. All three phase equipment shall have two separate and distinct body earths and single phase equipment shall have a single body earth.
5. Separate earth leads of appropriate size shall be provided for.
    a. Main switchboards
    b. UPS system earth bus
    c. Computer system earth bus
    d. Telephone system earth bus

    Wherever so specified the earth lead shall be PVC sheathed to provide a —cleanǁ earth.
6. All metallic components and pipes within bathrooms, toilets and kitchens shall be connected to the earthing system by means of minimum 4 sq mm PVC insulated (green/yellow) copper conductor wires.

6.3.4.2. Standards

The earthing system shall be carried out in conformity with the updated and current edition of IS 3043: 1987. In addition, relevant clauses of Indian Electricity Act 2003, India Electricity Rules 1956 and IEE Wiring Regulations (16th edition), as amended up-to-date, shall also be applicable.

6.3.4.3. Earth Electrodes

1. Plate Earth Electrodes: The plate electrodes shall be of copper or GI as called for in the schedule of quantities. Minimum dimensions of the electrodes shall be 600 mm x 600 mm. Thickness of copper electrodes shall not be less than 3 mm and of GI electrodes not less than 6 mm.
2. Pipe Earth Electrode: Pipe electrode shall be fabricated from a 40 mm dia 4500 mm long class B (medium) GI pipe. The GI pipe shall be tapered at the bottom and shall be provided with 12 mm dia holes drilled at every 75 mm.
3. Galvanizing: Galvanizing of Earth Electrodes and Earthing Conductors shall conform to class – IV of IS 4736: 1986.

6.3.4.4. Earth Pit

1. For plate electrodes: Plate electrode shall be buried in ground with its face vertical and top not less than 500 mm below ground level. The depth shall be increased if required so that permanently moist soil level is reached. The electrode shall be surrounded by alternate layers of

charcoal and salt. A 20 mm dia class B GI pipe shall be provided for watering of the soil surrounding the electrode. The watering pipe shall have a watering funnel attachment with a wire mesh which shall be housed in the masonry inspection chamber. Main earth lead shall be securely terminated at the electrode by means of 2 bolts, nuts, checknuts and spring washers. The earth lead from the electrode up to the test link in masonry chamber shall be drawn in a suitable diameter class B GI pipe for mechanical protection. The GI pipe shall be provided with a coat of bituminous paint or bituminized jute wrapping for additional corrosion protection. The lead shall terminate in a test link provided in the inspection chamber to enable the earth electrode to be isolated for measuring earth resistance.

2. For pipe electrodes: Pipe electrode shall be installed with its stop not less than 200 mm below ground level. The top shall be provided with a 40 mm x 20 mm reducer to fix watering funnel with mesh on top. The entire length of pipe below the inspection chamber shall be surrounded by alternate layers of charcoal and sand. Earth lead shall be provided as for plate electrode and shall be terminated using a though bolt, nuts, check nuts, spring washers etc.
3. Masonry inspection chamber: The watering funnel arrangement as also earth test links shall be accessible and shall be housed in a 400 mm x 400 mm x 400 mm deep masonry inspection chamber having a lockable 10 mm thick cast iron hinged cover plate attached to a galvanized steel frame work embedded in the chamber walls. The hinged cover shall be suitably marked on top so that it is conspicuously identifiable as an earth station.
4. Location of earth electrodes: Location of earth electrodes shall be based on following guidelines.
    a. Minimum distance between any electrode and building structure shall be 1.5 m.
    b. Minimum distance between two adjacent electrodes shall be 2 m.
    c. Electrodes shall be located in accessible locations. Entrances, pavements and roads shall not be used for locating earth electrodes.

6.3.4.5. Earthing Conductor Main

Earth Lead

1. Interconnections between earth bus provided on the main switchboard inside the building for body earthing / neutral terminals of transformers / generators for neutral earthing and test link provided in the earth electrode inspection chamber shall be laid at minimum 300 mm depth below ground (minimum 600 mm below road crossings and paved pavements).
2. For small installations where this lead is by means of GI / copper wire, the earth lead shall be drawn in a 15 mm dia class B GI pipe. For larger installations the GI pipe size shall be suitable for drawing the earth strip. GI pipe shall be provided with a coat of bituminous paint on the outside for minimizing corrosion. In locations where GI pipe protection cannot be provided, the earth conductor shall be wrapped with bituminous jute wrapping. Earthing conductors
3. Earthing conductors shall be connected to form the earthing network throughout the installation for earthing of all non-carrying metal parts as below. Materials and sizes shall be as per schedule of quantities
    a. Main earthing conductors shall be taken from the earth connections at the main switchboards to all other switchboards in the network.
    b. Sub-mains earthing conductors shall run from the main switchboard to the sub distribution boards and to the final distribution boards.
    c. Loop earthing conductors shall run from the distribution boards and shall be connected to any point on the main/sub-main earthing conductor, or its distribution board or to an earth leakage circuit breaker.

d. Conduiting systems and cable armouring shall be earthed at the ends adjacent to switchboards at which they originate, or otherwise at the commencement of the run by separate loop earthing conductors in effective electrical contact with cable armour, switch boxes, accessories, lighting fitting etc.

Installation and Jointing of earthing conductors

4. Earthing conductors shall be provided in longest possible unbroken length to minimize jointing of the conductors in between terminations.
5. Strip conductors shall be secured to the building walls etc. with appropriate size of saddles at intervals not exceeding 900 mm. The saddle shall be gun metal for copper and GI for GI strips.
6. Copper earth strips shall be joined by butt welding /brazing or the mating surfaces shall be tinned, riveted and soldered.
7. GI earth strips shall be joined by GI bolts, nuts, checknuts and spring washers of appropriate size.
8. All exposed joints shall be provided with 2 coats of anti-corrosive paint.
9. Wires shall be joined by means of lugs of appropriate size connected by bolts, nuts, checknuts and washers. If the connection is on a painted surface, the paint shall be thoroughly removed and the metal exposed for making effective electrical contact. Lugs and bolts shall be of brass for copper wires and for GI wires.

6.3.4.6. Prohibited Connections

Neutral conductor, sprinkler pipes, or pipes conveying gas, water, or inflammable liquid, structural steel work, metallic enclosures, metallic conduits and lighting protection system conductors shall not be used as a means of earthing an installation or even as a link in an earthing system.

6.3.4.7. Resistance To Earth

1. No earth electrode shall have a greater ohmic resistance than 3 ohms as measured by an approved earth testing apparatus. In rocky soil the resistance may be up to 5 ohms.
2. The electrical resistance measured between earth connection at the main switchboard and any other point on the completed installation shall be low enough to permit the passage of current necessary to operate circuit breakers, and shall not exceed 1 ohm.

6.3.4.8. Maintenance Free Earthing Electrode System/ Chemical Earthing

1. In maintenance free earthing copper bonded earthing rod electrode shall be of minimum 14.35 mm in diameter and 3 meter length. The rod shall be placed in a 150 mm dia an augured hole in the ground and then surrounded by ground enhancement material in either a dry form or pre mixed in a slurry. Once set, ground enhancement material becomes hard and as such holds positively to the rod as well as surrounding ground. Earth rod offered shall have passed the test required of BS7430/ ANSI/ UL467 and confirm to the adhesion of the copper coating to the steel core (Design feature that prevents the ingress of moister and subsequently the integrity of the rod.
2. Minimum 0.25 mm thickness of copper shall be deposited over the steel core as per BS 7430/ UL 467. Average life of the ground rod shall be 30 years in most soil.
3. Ground enhancement material shall be as per IEEE-80 clause 14.5d with a resistivity of less than 0.12 ohm-meter. The ground enhancement material shall be permanent and not leach any chemicals in to the ground.
4. Minimum 30 Kg of ground enhancement material shall be provided for each earth electrode.

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

6.3.4.9. Testing At Site

1. Testing Of Earth Continuity Path: The earth continuity conductor including metal conduits and metallic envelopes of cable in all cases shall be tested for electric continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance of earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.
2. Earth Resistivity Test: Earth resistivity test shall be carried out in accordance with IS Code of Practice for earthing IS 3043.

6.3.5. Section V- Wiring

6.3.5.1. General

1. Technical Specifications in this section cover the Internal Wiring Installation in concealed/surface conduit/raceways pertaining to:
    a. Lights and fans
    b. Convenience socket outlets
    c. Submain wiring

6.3.5.2. Standards and codes

2. Updated and current Indian Standard Specifications and Codes of Practice as stipulated below shall apply to the equipment and the work covered in this section. In addition the relevant clauses of the Indian Electricity Act 1910, Indian Electricity Rules 1956, National Building Code 1994, National Electric Code 1985, Code of Practice for Fire Safety of Building (general) : General Principal and Fire Grading – IS 1641 and IEE wiring regulation 16th edition as amended up to date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

a.	660/1100 V grade FRLS PVC insulated wires.	IS	694 : 1990
b.	MS conduits for electrical wiring.	IS	9537 : Part I 1980
		IS	9537: Part II 1981
c.	Accessories for rigid steel conduits	IS	3837 : 1990
d.	Flexible steel conduits for electrical wiring	IS	3480 : 1990
e.	Switch socket outlets	IS	4615 : 1990
f.	3 pin plugs and socket outlets up to 250 volts	IS	1293 : 1988
g.	General and safety requirements for fluorescent lamps luminaries	IS	1913 : 1978
h.	Switches for domestic and similar purposes	IS	3854 : 1997
i.	Boxes for the enclosure of electrical accessories	IS	5133 : Parts I &II 1969
j.	Danger notice plates	IS	2551 : 1982
k.	Code of practice for personal hazard fire safety of buildings	IS	1644: 1998

l. Code of practice for electrical installation fire safety of buildings IS 1646 : 1997

m. Code of practice for electrical wiring installations IS 732 : 1989

n. Code of practice of fire safety buildings (General- Electrical installations) IS 1646 : 1982

o. Guide for safety procedure and practices in electrical works IS 5216 : 1982

6.3.5.3. Materials (conduits & accessories)

1. MS Conduits

   All conduits shall be of heavy gauge solid drawn ERW welded manufactured out of 16 (1.6mm) gauge MS Sheet up to 32mm dia and of 14 (2 mm) gauge for sizes higher than this. Both inner and outer surfaces shall be smooth without burrs, dents and kinks. Conduits shall be black stove enameled inside and outside. The cross section of conduit shall be uniform throughout. The welding shall be uniform such that welded joints do not yield when subjected to flattening test. Welded joint shall not break when threaded or bent at an angle. Conduit shall conform to specifications of IS: 9537 (Part-II) and the capacity of conduits shall be in accordance with the standards and shall never be exceeded. The minimum size of the conduit shall be 20mm dia. Care shall be taken to ensure that all conduits are adequately protected while stored at site prior to erection and no damaged conduit shall be used.

2. Joints All jointing shall be subject to the approval of the Owner‘s site representative. The threads and sockets shall be free from grease and oil, Connections between screwed conduit and GI boxes shall be by means of hexagon brass check nut, fixed outside and brass bush from inside the box. The joints in conduits shall be free of burrs to avoid damage to insulation of conductors while pulling them through the conduits.

3. Recessed or Exposed conduit

   All conduits shall be as per Schedule of Quantities.

4. Flexible Conduit

   Wiring for short extensions to outlets in hung ceiling or to vibrating equipment, motors etc. shall be installed in flexible conduits. Flexible conduits shall be formed from a continuous length of spirally wound interlocked wire steel with a fused zinc coating on both sides. The conduit shall be provided with approved type adaptor. A separate and accessible earth connection shall bond across the flexible conduit.

5. Conduit Accessories.

   a. Standard accessories

      Heavy duty black enamel painted / galvanized standard conduit fittings and accessories like standard/extra-deep circular boxes, looping in boxes, junction boxes, solid /inspection elbows , solid/inspection tees, couplers, nipples, saddles, check nuts, earth clips, ball socket joints, bushes etc. shall be of superior quality and of approved makes. Heavy duty covers screwed with approved quality screws shall be used. Samples of all conduits fittings and accessories shall be got approved by Engineer-in-Charge before use.

   b. Fabricated accessories

      Wherever required, outlet/junction boxes of required sizes shall be fabricated from 1.6 mm thick MS sheets excepting ceiling fan outlet boxes which shall be fabricated from minimum 3 mm thick sheets. The outlet boxes shall be of approved quality, finish and

manufacture. Suitable means of fixing connectors etc., if required, shall be provided in the boxes.

The boxes shall be protected from rust by zinc phosphate primer process. Boxes shall be finished with minimum 2 coats of enamel paint of approved colour. A screwed brass stud shall be provided in all boxes as earthing terminal.

c. Outlet Boxes for Light Fittings.

These shall be minimum 75mm x 75mm x 50mm deep and provided with required number of threaded collars for conduit entry. For ceiling mounted florescent fittings, the boxes shall be provided 300 mm off centre for a 1200 mm fitting and 150 mm off centre for a 600 mm fitting so that the wiring is taken directly to the down rod. 3 mm thick perspex/hylam sheet cover of matching colour shall be provided.

d. Outlet Boxes For Ceiling Fans

Outlet boxes for ceiling fans shall be fabricated from minimum 3 mm thick MS sheet steel. The boxes shall be hexagonal in shape of minimum 100 mm depth and 60 mm sides. Each box shall be provided with a recessed fan hook in the form of one 'U' shaped 15 mm dia rod welded to the box and securely tied to the top reinforcement of the concrete slab for a length of minimum 150 mm on either side. 3 mm thick Perspex/hylam sheet cover of matching colour shall be provided.

6. PVC Conduit and Accessories

Conduits and accessories shall conform to latest edition of IS-9537 part 3 and shall be heavy duty with minimum wall thickness of 2.0 mm rigid tubes which are unscrewed without coupling and with plain ends. All sections of conduit and relevant boxes shall be properly cleaned and glued by using epoxy resin glue and the proper connecting pieces. All conduits used shall be ISImarked and shall not be less than 20 mm diameter.

a. PVC conduit shall be used for all concealed / embedded installation.

b. PVC Conduit Accessories

c. Accessories used for conduit shall be of an approved brand and type complying with relevant IS code.

d. All accessories used shall be of standard white or black colour, identical to conduit used.

e. Plain conduits shall be joined by slip type of couplers with manufacturer‘s standard sealing cement.

f. All conduit entries to outlet boxes, trunking and switchgear are to be made with adaptors female thread and screwed male bushes.

g. PVC-switch and socket boxes with round knockouts are to be used. The colours of these boxes and the conduits shall be the same.

h. Standard PVC circular junction boxes are to be used with conduits for intersection, Teejunction, angle-junction and terminal. For the drawing-in of cables, standard circular through boxes shall be used.

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

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

7. Bends in Conduit

Where necessary, bends or diversions may be achieved by means of bends and / or circular cast iron inspection boxes with adequate and suitable inlet and outlet screwed joints. In case of

recessed system each junction box shall be provided with a cover properly secured and flush with the finished wall surface.

No bends shall have radius less than 7.5 cms or three times the outside diameter of the conduits. No run of conduit shall have more than four right angle bends from outlet to outlet. Bends in multi runs of conduits shall be parallel to each other and neat in appearance, maintaining the same distance as between straight runs of conduits.

8. Conduit Installation

   a. System

      The whole conduit system shall be installed to comply fully with relevant provision in Indian Standard Specifications, Indian Electricity Rules and IE wiring regulations. Conduits shall be laid either recessed in walls and ceilings or on surface on walls and ceilings or partly recessed and partly on surface, as required. Same rate shall apply for recessed and surface conduiting in this contract. Stranded copper conductor insulated wire of size as per schedule of quantities shall be provided in entire conduiting for loop earthing. Steel wire of suitable size to serve as a fish wire shall be left in all conduit runs to facilitate drawing of wires after completion of conduiting.

   b. Installation

      Conduits shall be laid before casting in the upper portion of a slab or otherwise, as may be instructed or in accordance with approved drawings, so as to conceal the entire run of conduits and ceiling outlet boxes. Vertical drops shall be buried in columns or walls. Wherever necessary, chases will be cut by the contractor with the help of chase cutting m/c or by hand. Nothing extra shall be paid to the contractor on this account. In case of exposed brick/ rubble masonry work special care shall be taken to fix the conduit and accessories in position along with the building work. Sufficient depth of the chases will be made to accommodate the required number of conduits. The chase will be filled with cement, coarse sand mortar (1:3) and properly cured by watering for one week.

   c. If a chase is cut in an already finished surface the contractor shall fill the chase and finish it to match the existing finish. Contractor must not cut any iron bars to fix conduits. Conduits shall be kept at a minimum distance of 100mm from the pipes of other nonelectrical services. Where the conduit is to be embedded in a concrete member it shall be adequately tied to the reinforcement to prevent displacement during casting, conduits in chases shall be held by steel hooks of approved design at maximum of 100 cm centres. The embedding of conduits in walls shall be so arranged as to allow at least 12mm plaster cover the same. All threaded joints of conduit pipes shall be treated with some approved ‗preservative compound' to secure protection against rust.

   d. Suitable expansion joints fittings of approved make and design shall be provided at all the points where the conduit crosses the expansion joint in the building.

      Separate conduit shall be used for:

      i. Normal light, fan call bell

      ii. 16 A power outlets

      iii. Emergency Light Point

      iv. Fire alarm System

      v. Computer Outlets

      vi. P.A System

      vii. Telephone system

viii. TV Network

ix. Or any other services not mentioned here.

e. Conduit runs on surfaces shall be supported with metal 1.2 mm thick saddles, which in turn are properly secured on to GI spacer to the wall or ceiling. Fixing screws shall be with round or cheese head and of rust proof materials. Exposed conduits shall be neatly run parallel or at right angles to the walls of the building and shall be painted in color matching the adjoining area.

Cross cover of conduits shall be minimum and entire conduit installation shall be clean and with good appearance. For surface work, the boxes shall be raised back pattern type, designed for use with distance saddles to give clearance of 6mm between the back of conduit and the fixing surface.

f. Where conduits are run on steel work, they will be fixed by means of purpose made GI Caddy clips in manner meeting with the approval of the Engineer prior to the installation being carried out. Other methods of fixing may be agreed in special circumstances, but approval must first be obtained from the site engineer.

g. The spacing of saddles shall be not more than 600mm centers for up to 32mm diameter conduits and at 750mm for conduit sizes of 40mm diameter and above in case of MS conduit and not more than 600 mm for PVC conduit. In addition, saddles shall be fixed at each side of any bend/Tee, or set at a distance of 200mm from the bend/Tee.

h. Suitable size of boxes shall be provided a minimum of 2 adjustable fixing lugs on vertical sides. Suitable earth terminal inside each box shall be provided. All fixing lugs shall be threaded to receive standard machined chromium plated brass screws. Sufficient number of knockouts shall be provided for conduit entry. Conduits carrying wires of different circuit can terminate in common J.B having metal compartments. Necessary GI pull wires shall be inserted into the conduit for drawings wires. In case conduit pipe is required to cross any RCC beam special adopter boxes shall be provided for crossing & nothing shall be paid extra.

i. Particular care shall be taken during the progress of the work to prevent the ingress of dirt and rubbish such as plaster droppings into erected conduits. Conduit which has become so clogged shall be entirely freed from these accumulations or will be replaced. Screwed plastic or metal caps or turned wooden plugs shall be employed to protect all open ends. Plugs of waste wood, paper, cotton or other fibrous matter shall not be used. All unused conduit entries shall be blanked off in an approved manner and where conduits terminate in adaptable boxes, all removable box covers shall be firmly secured to provide complete enclosure.

j. All conduit installations must be completed and erected in their totality before they are wired and must be fully rewireable from outlets to distribution boards or trunking systems etc. to which they connect. No wiring of any part of the installation shall be commenced until instructions are received to do so by the Engineer-in-charge at such time as he is satisfied that the wiring will not be damaged due to building operations.

k. Conduits shall be installed so that they are self draining in the event of ingress of moisture due to condensation or any other reason. A suitable drainage hole shall be drilled at the bottom of the lowest conduit box in every 9-meter of horizontal run.

l. PVC bush of good quality shall be used in each conduit termination in a switch box, draw box, lighting fixtures and circular junction boxes.

m. Exposed conduits running above false ceilings shall be suitably clamped independently along with the dropped ceiling. Perforated straphangers or twisted attachment shall not be acceptable. In no case shall raceways be supported or fastened to other pipe for

repair and maintenance. They shall be arranged symmetrically and in the cost compact design, in no way unduly criss-crossing each other. Proper spacing shall be maintained when two or more conduits run side by side. The layout of the pipes shall be coordinated with other services if any. The junction boxes and conduits used in hazardous areas shall be flameproof type with cast iron construction complete with threaded covers.

n. The conduit of each circuit or section shall be completed before conductors are drawn in. The entire system of conduit after erection shall be tested for mechanical and electrical continuity throughout and permanently connected to earth conforming to the requirements by means of special approved type of earthing clamp efficiently fastened to conduit pipe in a workman like manner for a perfect continuity between the earth and conduit.

o. The conduit system shall be so laid out that it will obviate the use of tees, elbows and sharp bends. No length of conduit shall have more than the equivalent of two-quarter bends from inlet to outlet. The conduit itself being given required smooth bend with radius of bends suiting to the site conditions but not less than 6 times overall diameter.

p. Outlet boxes shall be of heavy-duty sheet steel installed as to maintain continuity throughout. These shall be so protected at the time of laying that no mortar finds its way inside during concrete filling or plastering. For fluorescent fittings, the outlet boxes heavy duty shall be provided 300mm off centre for a 1200mm fitting and 150mm off centre for a 600mm fittings or as per B.O.Q.

q. Draw boxes of ample dimensions shall be provided at convenient points to facilitate pulling of long runs of cables. They shall be completely concealed with MS covers flush with plasterwork painted to match the wall.

6.3.5.4. Wiring capacity of conduits

1. Maximum number of PVC insulated 650/1100 V grade/copper conductor cable conforming to IS: 694-1990.

Conduit size	**20mm**		**25mm**		**32mm**		**40mm**		**50mm**		**60mm**	
Wire size in sq.mm.	**S**	**B**	**S**	**B**	**S**	**B**	**S**	**B**	**S**	**B**	**S**	**B**
1.5	7	5	12	10	20	14	-	-	-	-	-	-
2.5	6	5	10	8	18	12	-	-	-	-	-	-
4	4	3	7	6	12	10	-	-	-	-	-	-
6	3	2	6	5	10	8	-	-	-	-	-	-
10	2	-	4	3	6	5	8	6	-	-	-	-
16	-	-	2	-	4	3	7	6	-	-	-	-
25	-	-	-	-	3	2	5	4	8	6	9	7

2. Notes:

    a. The above table shows the maximum capacity of conduits for a simultaneous drawing in of cables.

    b. The columns heads ‗S'-Straight - apply to runs of conduits which have distance not exceeding 4.25 m between draw in boxes and which do not deflect from the straight by an angle of more than 15 degrees. The columns heads ‗B'- Bends - apply to runs of conduit which deflect from the straight by an angle of more than 15 degrees.

    c. Conduit sizes are the nominal external diameters.

6.3.5.5. Switch outlets and junction boxes

All outlet boxes for switches, sockets and other receptacles shall be rust proof and shall be of 2 mm thick mild steel sheets with HOT dipped galvanizing (or as specified in BOQ), having smooth external and internal surfaces to true finish. All outlet boxes for receiving plug sockets and switches shall be fabricated to approved sizes. All boxes shall have adequate number of knock out holes of required diameter and earthing terminal screws. Outlet boxes shall be of a maximum depth of 65 mm.

6.3.5.6. Inspection boxes

Inspection boxes of 50 mm dia of cast iron shall have smooth external and internal finish to facilitate removal and replacement of wires, where required.

6.3.5.7. Fish wire

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

6.3.5.8. Conductors

PVC insulated, Flame Retardant Low Smoke (FRLS) wires shall be single core unsheathed in voltage grade 1100 V as per IS 694 – 1990 with 99.97% pure electrolytic grade bright annealed stranded bare copper conductors. Special parameters of FRLS PVC insulation like critical oxygen index, temperature index, smoke density and flammability test shall conform to relevant IEC and ASTM Standards. Coil packing shall be ISI marked as stipulated in IS 694

6.3.5.9. Bunching of wires

Wires carrying current shall be so bunched that the outgoing and return wires are drawn into the same conduit. Wires originating from two different phases shall not run in the same conduit. All wires shall have ferrules for identification. Lighting and power circuits shall be separate.

6.3.5.10. Drawing conductors

1. The drawing and jointing of PVC insulated copper conductor wires shall be executed with due regard to the following precautions. While drawing wires through conduits, care shall be taken to avoid scratches and kinks which may cause breakage of conductors. There shall be no sharp bends. Wire reel stands to be used for pulling of wires to avoid kinks.
2. Insulation shall be removed by insulation stripper only. Strands of wires shall not be cut for connecting terminals. The terminals shall have sufficient cross sectional area to take all strands and connecting brass screws shall have flats ends. All looped joints shall be connected through terminal block/connectors. The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less. All light points shall be terminated through a connector.
3. All light points will terminated through a connector. Conductors having nominal cross sectional areas exceeding 10 sq.mm shall always be provided with cable sockets. At all bolted terminals brass flat washer of large area and approved steel spring washer shall be used. Brass nuts and bolts shall be used for all connections.

4. Only licensed wiremen (Before doing the work or before appointing him on site contractor has to submit his wiring license to Owner) and cable jointers shall be employed to do jointing work. All wires and cables shall bear the manufacturer‘s label and shall be brought to site in original packing.
5. For all internal wiring. PVC insulated wires of 1100 volts grade shall be used. The sub-circuit wiring for point shall be carried out in loop system and no joints shall be allowed in the length of the conductors. No wire shall be drawn into any conduit until all work of any nature that may cause injury to wire is completed. Care shall be taken while pulling out the wires so that no damage occurs to conduits/wire itself, the conduits shall be thoroughly cleaned of moisture, dust, dirt or any other obstruction. The minimum size of PVC insulated copper conductor wires for all sub-circuit wiring for light points shall be minimum 2.5 sq.mm copper Separate neutral to be pulled for each circuit.

6.3.5.11. Joints

All joints shall be made at main switches, distribution boards, socket outlets, lighting outlets and switches boxes only. No joints shall be made in conduits and in junction boxes. Conductors shall be continuous from outlet to inlet.

6.3.5.12. Load balancing

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

6.3.5.13. Colour code of conductors

1. **Colour code for normal supply** – Red, Yellow, Blue for three Phases, Black for Neutral and Green for Earth – shall be maintained for the electrical wiring installation
2. **Colour code for UPS supply** – Red/white, Yellow/white, Blue/white for three Phases, white for Neutral and Green/yellow for Earth

6.3.5.14. Switches, receptacles (modular)

1. SWITCHES

   All switches shall be enclosed type flush mounted suitable for 240 volts AC. All switches shall be fixed inside the switch boxes on adjustable flat M S strips/plates with tapped holes and brass machine screws, leaving ample space at the back and sides for accommodating wires. Switch controlling the light point shall be connected to the phase wire of the circuit and not more than ten lights shall be connected on one circuit and load shall be restricted to 800 watts. All wiring accessories shall be BIS approved.

2. WALL SOCKET OUTLET

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

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

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

   c. 6 amps and 16 amps socket outlet shall normally be fixed at any convenient height above the floor level based on request of Architect/Interior designer. The switch for 6 and 16 amps, socket outlet shall be kept along with the socket outlet.

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

In a room containing a fixed bath or shower, there shall be no socket outlet and there shall be no provision for connecting a portable appliance. Any stationary appliance connected permanently in the bath room shall be controlled by an isolator switch or circuit breaker having outlets at such location where water / moisture does not effect.

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

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

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

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

6.3.5.15. Measurement of wiring

1. Wiring for lights, fans and convenience socket outlets shall be measured and paid for on **Point Basis** as itemized schedule of quantities and as elaborated as below (unless otherwise stated).
2. Average wiring Length.
    a. The point wiring basis for wiring for lights, fans and convenience socket outlets shall assume average wiring length and average conduiting length per point based on parameters stipulated in below. The average wiring length and average conduiting length forming the basis of point wiring payment, shall take the electrical layouts of the entire project into consideration.
    b. Tenderers are advised to seek clarifications, if they so desire, on this aspect before submitting their tenders. No claim for extra payment on account of electrical layouts in part or whole of the project requiring larger average wiring and conduiting length per point, whether specifically shown in tender drawings or not, shall be entertained after the award of contract.
3. Point wiring for Lights – Primary and Secondary Light Points.

    In respect of group control of lights (more than one light controlled by one switch or MCB), wiring up to the first light in the group shall be measured and paid for as a primary light point. Wiring for other lights looped in one group for switch controlled as also MCB controlled lights shall be measured and paid for as secondary light points. Primary light points for switch controlled lights shall include the cost of control switch whereas primary light points controlled by MCBs shall not include the switch cost. The cost of MCB controlling such lights shall not be included in the primary light point rate since the MCB shall be paid for in the item of DB. Primary light points shall include the cost of circuit wiring (wiring from DB terminal to the first switch in the sub circuit)
4. Design Parameters

    Wiring shall be carried out as per following design parameters in recessed/ surface conduit/conduit cum raceway system.

a. Only looping system of wiring shall be adopted throughout. No joints excepting at wiring terminals shall be permitted.

b. All accessories shall be flush type unless otherwise stated.

c. For estimation of load, following loads per point shall be assumed.

Light points	60/100 Watts.
6 amps socket outlet points	100 Watts.
Fan points	60 Watts.
Exhaust fan points	100 Watts unless otherwise specified.
16 amp socket outlet points	500/1000 Watts. Unless otherwise specified

d. Light and fan points shall be wired on a common final sub-circuit. Each sub circuit shall not have more than a total of 10 nos. lights and fans or a load of 800 watts whichever is lesser unless specifically stipulated otherwise. Wiring shall be carried out in MS conduiting system.

5. Scope of Point Wiring

Wiring for Lights

a. **Primary Light Points :** Wiring for Primary light points, as defined above, shall commence at the DB terminals and shall terminate at the ceiling rose/connector in ceiling box/lamp holder via the control switch (for switch controlled lights). Rates for Primary light point wiring shall be deemed to be inclusive of the cost of entire material and labour require for completion of Primary light point thus defined including : .

b. Recessed/surface conduiting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required,

c. Wiring with stranded copper conductor FRLS PVC insulated 660/1000 volt grade wires including terminations etc. complete as required.

d. Control switch with switch box and cover plate of specified type including fixing screws, earth terminal etc. complete as required. Cost of this switch is applicable only for switch controlled points. This cost shall not be applicable for DB controlled Primary light points.

e. Loop earthing with insulated copper wires.

6. Secondary Light points :

Secondary light points shall cover the cost of interconnection wiring between group controlled light fittings and shall be deemed to be inclusive of the cost of entire materials and labour required for completion of the secondary light point thus defined including

a. Recessed / surface conduiting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required,

b. Wiring with stranded copper conductor FRLS PVC insulated 660/1000 volt grade wires including terminations etc. complete as required.

c. Loop earthing with insulated copper wires.

7. Wiring for Ceiling Fans

Wiring for ceiling fan points shall be same as for Primary light points and shall, in addition, include ceiling outlet box with recessed fan hooks and installation of fan regulator.

8. Wiring for Exhaust Fans

Wiring for exhaust fan points shall be same as for Primary light points and shall in addition include the cost of providing a 3/5 pin 6 amp socket outlet near the fan along with plug top and a separate 6 amp control switch.

9. Wiring for Convenience Socket Outlets

   Wiring for 6 amps socket outlets on work tables shall be carried out partly in MS conduits and partly in MS raceways as indicated in electrical layout drawings. Wiring for socket outlets (6 amps as well as 16 amps) in locations other than workstations shall be carried out in MS conduits only.

10. Point wiring for 3 pin 6 amps convenience socket outlets

    Point wiring for 3 pin 6 amps socket outlets on point wiring basis shall be the same as Primary light points defined in para 3.17.4.1 and shall in addition include 3 pin 6 amp socket outlet with 6 amp control switch in GI box with cover. Including loop earthing of the third pin complete as required and as itemized in scheduled of quantities.

11. Point wiring for 3 pin 16 amps convenience socket outlets

    Point wiring for 3 pin 16 amps socket outlets on point wiring basis shall be the same as Primary light point defined in para 3.17.4.1 and shall in addition include 3 pin 16 amp socket outlet with 16 amp control switch in MS box with cover. Including loop earthing of the third pin complete as required and as itemized in scheduled of quantities.

12. Sub-mains Wiring

    Sub-mains wiring shall be measured and paid for on linear basis as per the length of conduit actually installed between terminations. This shall include conduit system with all accessories, wires and insulated loop earthing conductors as itemised in schedule of quantities. The quoted rates shall include termination of wiring at either end. Cost of wires only without conduits at either end required for end terminations and taken inside switchboards etc. shall be deemed to be included in the liner running meter rate of Submain wiring in conduit and no extra shall be paid for such additional wiring without conduit.

6.3.5.16. Routine and completion tests

1. Installation Completion Tests

   At the completion of the work, the entire installation shall be subject to the following tests: i. Wiring continuity test ii. Insulation resistance test iii. Earth continuity test iv. Earth resistivity test

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

3. Wiring Continuity Test

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

4. Insulation Resistance Test

   The insulation resistance shall be measured between earth and the whole system conductors, or any section thereof with all protection in place and all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it does not exceed 1100 volts for LT circuits. Where the supply is derived from AC three phase system,

the neutral pole of which is connected to earth, either direct or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral.

5. The insulation resistance measured as above shall not be less than 50 megohms divided by the number of points provided on the circuit the whole installation shall not have an insulation resistance lower than one megohm.
6. The insulation resistance shall also be measured between all conductors connected to one phase conductor of the supply and shall be carried out after removing all metallic connections between the two poles of the installation and in those circumstances the insulation shall not be less than that specified above.
7. The insulation resistance between the frame work of housing of power appliances and all live parts of each appliance shall not be less than that specified in the relevant Standard specification or where there is no such specification, shall not be less than half a megohm or when PVC insulated cables are used for wiring 12.5 megohms divided by the number of outlets. Where a whole installation is being tested a lower value than that given by the above formula subject to a minimum of 1 Megohms is acceptable.

6.3.5.17. Testing of earth continuity path

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

6.3.5.18. Testing of polarity of non-linked single pole switches

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

6.3.5.19. Earth resistivity test

Earth resistivity test shall be carried out in accordance with IS Code of Practice for earthing IS 3043.

6.3.5.20. Performance

Should the above tests not comply with the limits and requirements as above the contractor shall rectify the faults until the required results are obtained. The contractor shall be responsible for providing the necessary instruments and subsidiary earths for carrying out the tests. The above tests are to be carried out by the contractor without any extra charge.

6.3.5.21. Tests and test reports

The Contractor shall furnish test reports and preliminary drawings for the equipment to the Engineer-inCharge for approval before commencing supply of the equipment. The Contractor should intimate with the tender the equipment intended to be supplied with its technical particulars. Any test certificates etc., required by the local Inspectors or any other Authorities would be supplied by the Contractor without any extra charge. All test reports shall be approved by the Engineer-in-Charge prior to energizing of installation.

6.3.6. Section – VI: Cabling For Voice, Data System

6.3.6.1. Scope

This document defines the cabling system and subsystem components to include cable, termination hardware, supporting hardware, and miscellany required to furnish, and to install a complete cabling

infrastructure supporting voice and video. The intent of this section is to provide pertinent information to allow the vendor to bid the labour, supervision, tooling, materials, and miscellaneous mounting hardware and consumables to install a complete system. However, it is the responsibility of the vendor to propose any, and, all items required for a complete system whether or not it is identified in the specification, drawings and bill of materials attached to this specification.

6.3.6.2. Applicable documents

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

a. This Technical Specification and Associated Drawings

b. ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard – March 2001

c. ANSI/EIA/TIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces - February, 1998

d. ANSI/EIA/TIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings - February, 1993

e. ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications - August, 1994

6.3.6.3. Telephone network Telephone

Tag Block:

General

1. The telephone tag blocks shall be suitable for the multi core telephone cables and shall have two terminal blocks, cross connect type. All incoming and outgoing cables shall be terminated on separate terminal blocks and termination shall be silver soldered. The cross connecting jumpers shall be insulated wires of same diameter and screw connected.
2. The tag blocks shall be mounted inside fabricated sheet steel boxes with removable hinged covers and shall be fully accessible. The enclosure shall be painted with 2 coats of red oxide and stove enamelled.
3. CAT-5e (enhanced) unshielded twisted pair cable in MS/PVC conduit shall be used to have modern structured cabling network for telephone system, to have latest facilities for Internet and also data cabling. All the telephone Jack must terminated on RJ-11 jacks and installed onto a dual Jack faceplate. Telephone RJ-11 Jacks must be terminated with a Connector/Jack.

6.3.6.4. Equipment room

The equipment room shall be defined as an area within the building where telecommunications systems shall be housed along with the mechanical termination of one or more portions of the telecommunications wiring system. Equipment room shall be considered to be distinct from telecommunications closets because of the nature or complexity of the equipment they contain. Any or all of the functions of a telecommunications closet shall be alternatively provided by an equipment room. **6.3.6.5. Cable specifications** 1. UTP cabling system

Unshielded twisted pair cabling system, TIA / EIA 568-B.1 addendum Category 5e Cabling system	
a. Networks Supported	10 / 100 Ethernet, 155 Mbps ATM, 1000 Mbps IEEE 802.3ab Ethernet, and proposed Cat 6 Gigabit Ethernet

b. Warranty	25-year systems warranty; Warranty to cover Bandwidth of the specified and installed cabling system, and the installation costs
c. Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR for 4-connector channel
Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2	
a. Material:	
b. Conductors	23 AWG solid bare copper or better
c. Insulation	Polyethylene
d. Jacket	Flame Retardant PVC
e. Pair Separator	Cross-member fluted Spline.
f. Approvals	UL Listed
	ETL verified to TIA / EIA Cat 6
g. Operating temperature	-20 Deg. C to +60 Deg. C
h. Frequency tested up to	Minimum 600 MHz
i. Packing	Box of 305 meters
j. Delay Skew	45ns MAX.
k. Impedance	100 Ohms + / - 15 ohms, 1 to 600 MHz.
l. Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR

2. Category 5 Riser Cable

This cable shall consist of solid copper conductors insulated with expanded polyethylene covered by a PVC sheet.

The core shall be covered with a layer of plastic tape and overlaid with a corrugated PVC plastic. It shall be suitable to be used without conduit. The cable shall meet. EIA/TIA -568, C S A T 529, IEEE 802.3 & 10 B A S E -T. The pair sizes shall be as per the schedule of quantities. The cable shall meet the following specifications.

a. Maximum DC Resistance 26.5 ohm per 100 ft.

b. Maximum DC Unbalanced Resistance 17%

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

6.3.6.6. Testing

All the ports post termination should be tested to avoid any future data packet loss using Penta scanning.

1. All the test result with complete documentation should be taken from cabling vendor.
2. Testing of network site should be as per EIA/TIA standard for 20/25 years network guarantee and certification on passive components.
3. Testing & labelling:
    a. All fiber-optic cables and connectors shall be tested.

b. All voice cables and connectors shall be tested for continuity and pin-out as well as live circuit operation.

c. All date cables, connectors and patch cables shall be tested to EIA /TIA *568 specification using a Penta Scanner.

d. All Cables, racks, enclosures, patch panels, blocks and faceplate shall be professionally and clearly labelled using an electronic labelling devise in accordance with planned network labelling scheme.

6.3.6.7. Warranty

Owner seeks warranty for the installed cable plant from the OEM equipment supplier. Bidder shall ensure that the OEM norms for supply, installation, testing and documentation as specified by the OEM supplier shall be adhered to, provided those are in line with TIA / EIA standards and Owner requirement specifications. The warranty shall be provided by the OEM vendor to Owner and shall be administered in India. The duration of the warranty shall be for a minimum of 25 years and shall cover the system performance, application assurance and the costs of the supply of components and installation. **6.3.7. Section –VII: Cabling For Data System**

6.3.7.1. Scope

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

6.3.7.2. Applicable documents

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

1. This Technical Specification and Associated Drawings
2. ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard – March 2001
3. ANSI/EIA/TIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces - February, 1998
4. ANSI/EIA/TIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings - February, 1993
5. ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications - August, 1994

6.3.7.3. Cabling system and component specifications

1. UTP Cabling System

Unshielded twisted pair cabling system, TIA / EIA 568-B.1 addendum	**Category 6 Cabling system**
Networks Supported	1000 Ethernet, 155 Mbps ATM, 1000 Mbps IEEE 802.3ab Ethernet, and proposed Cat 6 Gigabit Ethernet
Warranty	25-year systems warranty; Warranty to cover Bandwidth of the specified and installed cabling system, and the installation costs

Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR for 4connector channel

Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2

Material:	
Conductors	23 AWG solid bare copper or better
Insulation	Polyethylene
Jacket	Flame Retardant PVC
Pair Separator	Cross-member fluted Spline.
Approvals	UL Listed
	ETL verified to TIA / EIA Cat 6
Operating temperature	-20 Deg. C to +60 Deg. C
Frequency tested up to	Minimum 600 MHz
Packing	Box of 305 meters
Delay Skew	45ns MAX.
Impedance	100 Ohms + / - 15 ohms, 1 to 600 MHz.
Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR

2. UTP Jacks

Type	**PCB based, Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2**
Durability	
Modular Jack	750 mating cycles
Wire terminal	200 termination cycles
Accessories	Strain relief and bend-limiting boot for cable
	Integrated hinged dust cover
Materials	
Housing	Polyphenylene oxide, 94V-0 rated
Wiring blocks	Polycarbonate, 94V-0 rated
Jack contacts	Phosphorous bronze, plated with 1.27micro-meter thick gold
Approvals	UL listed
Performance Characteristics to be provided with bid	Attenuation, NEXT, PS NEXT, FEXT and Return Loss

3. UTP Jack Panels

Type	**24-port, PCB based, Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2**
Ports	24
Port arrangement	Modules of 6-ports each, arranged 1port x 6.
Category	Category 6
Circuit Identification Scheme	Icons on each of 24-ports

Port Identification	9mm or 12mm Labels on each of 24-ports (to be included in supply)
Height	1 U (1.75 inches)
Durability	
Modular Jack	750 mating cycles
Wire terminal (110 block)	200 termination cycles
Accessories	Strain relief and bend limiting boot for cable
Materials	
Housing	Polyphenylene oxide, 94V-0 rated
Wiring blocks	Polycarbonate, 94V-0 rated
Jack contacts	Phosphorous bronze, plated with 1.27micro-meter thick gold
Panel	Black, powder coated steel
Approvals	UL listed
Termination Pattern	TIA / EIA 568 A and B;
Performance Characteristics to be	Attenuation, NEXT, PS NEXT, FEXT and Return Loss provided along with bid

4. Faceplates

Type	**1-port, White surface box**
Material	ABS / UL 94 V-0
No. of ports	One

5. Workstation / Equipment Cords

Type	**Unshielded Twisted Pair, Category 6, TIA / EIA 568-B.2**
Conductor	24 AWG 7 / 32, stranded copper
Length	7-feet
Plug Protection	Matching colored snag-less, elastomer polyolefin boot
Warranty	25-year component warranty
Category	Category 5
Plug	
Housing	Clear polycarbonate
Terminals	Phosphor Bronze, 50 micron gold plating over selected area and gold flash over remainder, over 100 micron nickel under plate
Load bar	PBT polyester
Jacket	PVC
Insulation	Flame Retardant Polyethylene

Wireless Signal: The color of this parameter‘s progress bar provides a visual Interpretation of signal strength. Values are given below

Excellent (green) : -57 to -45 dBms (75 to 100 %)

Good (green) : -75 to -58 dBms (40 to 74 %)

Fair (Yellow) : -85 to -76 dBms (20 to 39 %)

Poor (Red) : -95 to -86 dBms (0 to 19 %)

The guest rooms should have excellent wireless coverage.

Note: Termination of active & Passive components shall be the part of system Integrator

6.3.7.4. Testing

1. All the ports post termination should be tested to avoid any future data packet loss using Penta scanning.
2. All the test result with complete documentation should be taken from cabling vendor.
3. Testing of network site should be as per EIA/TIA standard for 20/25 years network guarantee and certification on passive components.
4. Testing & labelling:
    a. All fiber-optic cables and connectors shall be tested.
    b. All voice cables and connectors shall be tested for continuity and pin-out as well as live circuit operation.
    c. All date cables, connectors and patch cables shall be tested to EIA /TIA *568 specification using a Penta Scanner.
    d. All Cables, racks, enclosures, patch panels, blocks and faceplate shall be professionally and clearly labelled using an electronic labelling devise in accordance with planned network labelling scheme.

6.3.7.5. Warranty

Owner seeks warranty for the installed cable plant from the OEM equipment supplier. Bidder shall ensure that the OEM norms for supply, installation, testing and documentation as specified by the OEM supplier shall be adhered to, provided those are in line with TIA / EIA standards and Owner requirement specifications. The warranty shall be provided by the OEM vendor to Owner and shall be administered in India. The duration of the warranty shall be for a minimum of 25 years and shall cover the system performance, application assurance and the costs of the supply of components and installation. **6.3.8. Section – VIII: LT Switchboards**

6.3.8.1. General

This section covers specification of LT Switchboards

6.3.8.2. Standards and codes

Updated and current Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 2003, Indian Electricity Rules 1956, National Building Code 2005, National Electric Code

1985, Code of Practice for Fire Safety of Building (general): General Principal and Fire Grading – IS 1641 - 1988 as amended up to date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

Low Voltage switchgear & control gear IS/IEC 60947

Part I: General rules

Part II: Circuit Breakers

Part III: Switches, disconnectors, Switch disconnectors and fuse combination units

Part IV: Contactors and Motor starters

Part V: Control circuit devices and switching elements

Marking of Switchgear busbars	IS 11353: 1985
Degree of Protection of Enclosures for low voltage switchgear.	IEC 60529
Electrical relays for power system protection	IS 3231: 1986
Code of Practice for selection, installation and Maintenance of switchgear & control gear	IS 10118: 1982
Low voltage switchgear & control gear assemblies	IEC 60349
Danger notice plates	IS 2551: 1982

6.3.8.3. Moulded Case Circuit Breaker (MCCB)

1. The MCCB should be current limiting type with trip time of less than 10 msec under short circuit conditions. The MCCB should be either 3 or 4 poles as specified in BOQ. MCCB shall comply with the requirements of the relevant standards IEC 60947-2 and should have test certificates for Breaking capacities (Ics=ICU=100%) from independent test authorities CPRI / ERDA or any accredited international lab.
2. 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
3. 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 IEC60947-2, 1989/IS 13947-2. The breaker as supplied with ROM should meet IP54 degree of protection.
4. MCCB shall be suitable for positive Isolation as per IEC 60947-2
5. MCCB shall comply with ―Class-II front facia as per IEC 61140‖
6. MCCB shall be provided with continuously ratio coils.
7. MCCB shall have cross bolted termination.

6.3.8.4. Current Limiting & Coordination

1. 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. **The manufacturer shall provide both the discrimination tables and let-through energy curves for all. It shall be responsibility of Panel builder & OEM to carry out the discrimination study at the time of drawing approval.**
2. Protection Functions
    a. MCCBs with ratings up to 250 A shall be equipped with Thermal-magnetic (thermal for overload and magnetic for short-circuit protection) trip units
    b. Microprocessor MCCBs with ratings 250A and above shall be equipped with microprocessor based trip units. (both variable setting)
    c. Microprocessor and thermal-magnetic trip units shall be adjustable and it shall be possible to fit lead seals to prevent unauthorized access to the settings

d. Microprocessor trip units shall comply with appendix F of IEC 60947-2 standard (measurement of rms current values, electromagnetic compatibility, etc.)

e. Protection settings shall apply to all poles of circuit breaker.

f. All Microprocessor components shall withstand temperatures up to 125 °C

6.3.8.5. Testing

1. Original test certificate of the MCCB as per IEC 60947-1 &2 or IS13947 shall be furnished.
2. Pre-commissioning tests on the switch board panel incorporating the MCCB shall be done as per standard specifications.

6.3.8.6. Interlocking

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

1. Handle interlock to prevent unnecessary manipulations of the breaker.
2. Door interlock to prevent the door being opened when the breaker is in ON position.
3. Defeat-interlocking device to open the door even if the breaker is in ON position.
4. The MCCB shall be current limiting type and comprise of quick make – Break switching mechanism. MCCBs shall be capable of defined variable overload adjustment. All MCCBs rated 250 Amps and above shall have adjustable over load & short circuit pick-up both in Thermal magnetic and Microprocessor Trip Units.
5. All MCCB with microprocessor based release unit, the protection shall be adjustable Overload, Short circuit and earth fault protection with time delay.
6. The trip command shall override all other commands.

6.3.9. Section IX: Switchboards

6.3.9.1. General

1. Switchboards shall be suitable for operation at three phase 4 wire, 415 volt, 50 Hz, neutral solidly grounded at transformer system with a short circuit level withstand as per schedule of quantities and drawings.
2. Switchboards shall comply to Form 3B for compartmentalized boards and Form 1 for noncompartmentalized boards as per BS 5486 Part I – 1990 and IEC 439-1
3. The enclosures shall be designed to take care of normal stress as well as abnormal electromechanical stress due to short circuit conditions. All covers and doors provided shall offer adequate safety to operating persons and provide ingress protection of IP 54 unless otherwise stated. Ventilating openings and vent outlets, if provided, shall be arranged such that same ingress protection of IP 54 is retained. Suitable pressure relief devices shall be provided to minimize danger to operator during internal fault conditions.
4. Entire switchgear used in switchboards shall be completely fuse free. No fuses shall be used anywhere in the installation.
5. All accessible bares terminals shall be provided with integral shrouds and shall be finger touch proof.
6. Bimetallic connectors shall be provided for termination of cable with aluminium conductors on copper bus bars.

6.3.9.2. Switchboard Configuration

1. The Switchboard shall be configured with Air Circuit Breakers, MCCB's, and other equipment as called for in the schedule of quantities.
2. The MCCB's shall be arranged in multi-tier formation whereas the Air Circuit Breakers shall be arranged in Single or Double tier formation only to facilitate operation and maintenance.
3. The Switchboards shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switch gear.

6.3.9.3. Equipment Specifications

All equipment used to configure the Switchboard shall comply with the relevant Standards and Codes of the Bureau of Indian Standards and to the detailed technical specifications as included in this tender document.

6.3.9.4. Constructional Features

1. The Switchboards shall be metal clad totally enclosed, floor mounted free standing type of modular extensible design suitable for indoor mounting. The Switchboards shall be designed for a temperature rise restricted to 40 Deg C above ambient of 45 Deg C
2. Switchboards shall be either compartmentalized or non-compartmentalized as stipulated in schedule of quantities.
3. Switchboards shall be made up of requisite vertical sections, which when coupled together, shall for continuous dead front switchboards.
4. Switchboard shall be readily extensible on both sides by addition of vertical sections after removal of the end covers.
5. The switchboards shall be designed for use in high ambient temperature and humid tropical conditions as specified. Ease of inspections, cleaning and repairs while maintaining continuity of operation shall be provided in the design.
6. Metal based neoprene gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of protection of IP 54 as stipulated in schedule of quantities.
7. ‗U' Channels forming switchboard frames shall be fabricated from 2.5 mm thick electro galvanized MS sheets. All joints shall be neatly formed and finished flush with adjacent surfaces by grinding. No joints shall be located in corners. Bare edges shall be lipped. Structural members and bracings where ever required shall be welded or bolted to the frame. The frame shall be of modular design and extensible.
8. All doors and covers shall also be fully gasketed with metal based neoprene gaskets with fastners designed to ensure proper compression of the gaskets. The hinged door shall open a maximum of 150^0. All hinged doors shall have earth braid connected to the cubicle. Good quality door handles fitted with toggles to operate rods to latch with suitable slots in both top and bottom of switchboards shall be provided. Latching rods and associated brackets shall be cadmium plated.
9. Each vertical section shall be provided with a rear side cable chamber housing the cable end connections and power/control cable terminations. There should be generous availability of space for ease of installation and maintenance with adequate safety for working in one vertical section without coming into contract with any liver parts.
10. Switchboard panels and cubicles shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0 mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be fabricated from CRCA sheet steel of thickness not less than 1.6 mm. Joints of any kind in sheet metal shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal.

11. All panels and covers shall be properly fitted and square with the frame. The holes in the panel shall be correctly positioned.
12. Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self-threading screws shall not be used in switchboards.
13. All electrical contacts between dissimilar metals (e.g.. aluminium conductor of cables connected to copper terminals of breakers etc..) shall be through bimetallic connection

6.3.9.5. Switchboard Dimensional Limitations

1. A base channel 75 mm x 5 mm thick shall be provided at the bottom.
2. A minimum of 200 mm blank space between the floor of switchboard and bottom most unit shall be provided.
3. The overall height of the switchboard shall be limited to 2300 mm unless otherwise stipulated.
4. The height of the operating handle, push buttons etc. shall be restricted between 300 mm and 2000 mm from finished floor level.

6.3.9.6. Switchboard Compartmentalization

1. For compartmentalized switchboards, separate totally enclosed compartments shall be provided for horizontal busbars, vertical busbars, ACBs, MCCBs and cable alleys.
2. Earthed metal or insulated shutters shall be provided between drawout and fixed portion of the switchgear such that no live parts are accessible with equipment drawn out. Degree of protection within compartments shall be at least IP 4X.
3. Sheet steel hinged lockable doors for each separate compartment shall be provided and duly interlocked with the breaker in "ON" and "OFF" position.
4. For all Circuit Breakers separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, control contactors and control MCB etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, busbars and connections.
5. Each switchgear cubicles shall be fitted with label in front and back identifying the circuit, switchgear type, rating and duty. All operating device shall be located in front of switchgear only. Minimum height from floor level for any device mounted on panel cover shall be 250 mm.
6. A horizontal wire way with screwed cover shall be provided at the top to take interconnecting control wiring between vertical sections.
7. Separate cable compartments running the height of the switchboard in the case of front access boards shall be provided for incoming and outgoing cables.
8. Cable compartments shall be of adequate size for easy termination of all incoming and outgoing cables entering from bottom or top.
9. Adequate and proper support shall be provided in cable compartments to support cables.

6.3.9.7. Spare Provision

25% spare cubicles/space shall be provided in all switchboards to cater for future use.

6.3.9.8. Switchboard Bus Bars

1. Busbars shall be made of high conductivity, high strength aluminium alloy, complying with requirements of grade E 91E of IS 5082 – 1981. Design of busbar system shall comply to IS 5578 and IS 11353. Busbars shall be of rectangular cross sections suitable for full load current for phase bus bars as also neutral bus bar. The maximum current density shall be 1 amp per Sq.

mm. Busbar shall be suitable to withstand the stresses of fault level as specified in schedule of quantities.

2. Bus bars shall be insulted with heat shrunk PVC sleeving of 1.1 kV grade and bus bar joints provided with clip-on shrouds.
3. The bus bars shall be extensible on either side of the switchboard.
4. The bus bars shall be supported on non-breakable, non-hygroscopic epoxy resin or glass fiber reinforced polymer insulated supports able to withstand operating temperature of 110^{O} C at regular intervals, to withstand the forces arising from a fault level of 31 MVA at 415 volts for 1 second or as stipulated in schedule of quantities.
5. All bus bars shall be colour coded.
6. Auxiliary buses for control power supply, space heater power supply or any other specified service shall be provided. These buses shall be insulated, adequately supported and sized to suit specific requirement. The material for auxiliary supply bus will be electrolytic copper.
7. Additional cross sectional area to be added to the bus bar to compensate for the holes.

6.3.9.9. Switchboard Interconnection

1. All connection and tap offs shall be through adequately sized connectors appropriate for fault level at location. This shall include tap off to feeders and instrument/control transformers. Alternatively current limiters of approved make and type shall be used.
2. For unit ratings up to 100 amps, PVC insulated copper conductor wires of adequate size to carry full load current shall be used. The terminations of such interconnections shall be crimped. Solid connections shall be used for all rating of 100 amps and above.
3. All connections, tappings, clamping, shall be made in an approved manner to ensure minimum contact resistance. All connections shall be firmly bolted and clamp with .even tension. Before assembly joint surfaces shall be filed or finished to remove burrs, dents and oxides and silvered to maintain good continuity at all joints. All screws, bolts, washers shall be cadmium plated.
4. Approved spring washers shall be used with cadmium plated high tensile steel bolts with BSF threads.
5. All connectivity and tap offs shall have bimetallic connectors as required, finger touch proof terminals & integral switchgear shrouds.

6.3.9.10. Drawout Features

1. Air Circuit Breakers shall be provided in fully drawout cubicles, unless otherwise stated. These cubicles shall be such that drawout is possible without disconnection of the wires and cables. The power and control circuits shall have self-aligning and self-isolating contacts.
2. The fixed and moving contacts shall be easily accessible for operation and maintenance. Mechanical interlocks shall be provided on the drawout cubicles to ensure safety and compliance to relevant Standards. The MCCB's shall be provided in fixed type cubicles.

6.3.9.11. Instrument Accommodation

1. Instruments and indicating lamps shall not be mounted on the Circuit Breaker Compartment door for which a separate and adequate compartment shall be provided and the instrumentation shall be accessible for testing and maintenance without danger of accidental contact with live parts of the Switchboard.
2. For MCCB's instruments and indicating lamps can be provided on the compartment doors.
3. The current transformers for metering and for protection shall be mounted on the solid copper/aluminium busbars with proper supports.

6.3.9.12. Wiring

1. All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labelled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 2.5 sq. mm.
2. Wiring shall be terminated with ferrules on terminal block. CTs shall be provided with shorting facilities

6.3.9.13. Cable Terminations

1. Knockout holes of appropriate size and number shall be provided in the Switchboard in conformity with the location of incoming and outgoing conduits/cables.
2. The cable terminations of the Circuit Breakers shall be brought out to terminal cable sockets suitably located in the cable chamber
3. The cable terminations for the MCCB's shall be brought out to the rear in the case of rear access switchboards or in the cable compartment in the case of front access Switchboards.
4. The Switchboards shall be complete with tinned brass cable sockets, tinned brass compression glands, gland plates, supporting clamps and brackets etc. for termination of 1100 volt grade aluminium conductor XLPE cables.
5. Removable gland plates shall be provided for power and control cables. The gland plates shall be 3 mm thick and for single core cables shall be of non-magnetic material.

6.3.9.14. Space Heaters

Anti- condensation heaters shall be fitted in each cubicle together with an ON/OFF isolating switch suitable for electrical operation at 230 volts A.C 50 Hz single phase of sufficient capacity to raise the internal ambient temperature by 5^{O} C. The electrical apparatus so protected shall be designed so that the maximum permitted rise in temperature is not exceeded if the heaters are energized while the switchboard is in operation. As a general rule, the heaters shall be placed at the bottom of the cubicle.

6.3.9.15. Ventilation Fans

The Switchboard shall be provided with panel mounting type ventilation fans in each panel with switchgear rated for 2500 amp and above. The fan shall be interlocked with switchgear operation. If ventilation fans cannot be provided for maintaining the required degree of ingress protection, the design of switch board cubical shall incorporate suitable measures like decreasing current density of conductors, increasing cubical volume for effective heat dissipation etc. in order to restrict temperature rise to within the required limit.

6.3.9.16. Earthing

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

6.3.9.17. Sheet Steel Treatment And Painting

Sheet steel used in the fabrication of switchboards shall undergo a rigorous cleaning and surface treatment seven tank process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognised phosphating process after which a coat of primer paint compactively with the final paint shall be applied over the treated surface. Final paint coat of oven baked powder coating, of minimum 50 micron thickness, of sheet approved by Architects/Owners shall then be provided.

6.3.9.18. Name Plates And Labels

Suitable engraved white on black name plates and identification labels of metal for all Switchboards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

6.3.9.19. 19 Local Authorities Requirement

All other requirements by the local Authority that are imposed in course of execution of the work, particularly those listed below shall be provided.

a) Danger Signs
b) Rubber floor mat of 10 m thickness and 1 m width provided for the full length of the switchboard.
c) A dry chemical type fire extinguisher of 9 kg capacity with approved label
d) Framed single line diagram with minimum A1 size
e) First Aid Demonstration sign.

6.3.9.20. CPRI Testing

Switchboard configurations offered shall be CPRI tested. Copies of the CPRI test certificates shall be submitted with the tender.

6.3.9.21. Testing at works

Copies of type test carried out at ACB/MCCB manufacturers works and routine tests carried out at the switchboard fabricators shop shall be furnished along with the delivery of the switchboards. Architects/Owners reserves the right to get the switchboard inspected by their representative at fabricators works prior to dispatch to site to witness the routine tests

6.3.9.22. Installation

1. The foundations prepared as per the manufacturers drawings shall be levelled, checked for accuracy and the Switchboard installed. All bus bar connections shall be checked with a feeler gauge after installation. The cable end boxes shall be sealed to prevent entry of moisture. The main earth bar shall be connected to the sub-station earths.
2. Antistatic rubber matting of approved make conforming to IS 5424 – 1983, of minimum 1000 mm width 10 mm thickness shall be provided in front of and along the full length of the Switchboard. The rubber mat shall withstand 15 KV for 1 minute and leakage current shall not exceed 160 mA/sq. metre.
3. After installation the Switchboard shall be tested as required prior to commissioning.

6.3.9.23. Testing At Site

Pre-commissioning tests as required and as per manufacturers recommendations shall be carried out on each switchboards at site before energizing the switchboards including but not restricted to the following.

a) Physical checking of the switchboards including checking alignment of panels, interconnection of Bus bars, tightness of bolts/connections and evidence of damage/cracks in any components.
b) Physical checking and inspections of Inter panel wiring
c) Checking free movement of ACBs/MCCBs/SFUs
d) Checking of operation of breakers
e) Insulation tests of bus bar supports and control wiring etc. with 1.1 kV megger.
f) Primary & secondary injection tests of relays and CTs.
g) Checking of Interlocking function.

6.3.10. Section – X: Metering Equipment

6.3.10.1. General

This section covers specifications for Protection and Control Relays for breakers, Instrument Transformers, Measuring Instruments, Push Buttons, and Indicating Lamps etc. required in LT and HT switchboards.

6.3.10.2. Standards and codes

Updated and current Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 2003, Indian Electricity Rules 1956, National Building Code 1994, National Electric Code

1985, Code of Practice for Fire Safety of Building (general) :General Principal and Fire Grading – IS 1641 as amended up to date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

Application guide for Current Transformers	IS 4201:
Application guide for Voltage Transformers	IS 4140:
Application guide for Relays	IS 3842:
Electromagnetic Relays	IS 5051

6.3.10.3. Protection and control relays

1. The Circuit Breaker shall have protection and control relays as specified in the schedule of quantities. Relays shall be approved types complying with relevant ISS and having approved characteristic. Relays shall be flush mounted in dust proof cases. Relays shall be arranged so that adjustments, testing and replacement can be affected with minimum of time and labour.
2. In case of C.T. operated thermal overload and magnetic instantaneous short circuit release, the overload releases shall be such that each phase can be individually set depending on the phase unbalanced currents. The releases shall have inverse time current characteristics and the magnetic release shall be time delayed with a minimum setting of 25 ms varying up to 300 ms for discrimination without effecting the breaking current capacity of the ACB.

6.3.10.4. Current transformers

1. Separate sets of CTs shall be provided for metering and protection. C/Ts shall confirm to IS 2705 (part -I, II and III) in all respects. All C/Ts used for medium voltage application shall be rated for 1 kV. C/Ts shall have rated primary current, rated burden and class of accuracy as specified in Schedule of Quantities/drawings. Rated secondary current shall be 5A unless otherwise stated. Minimum acceptable class for measurement shall be class 0.5 to 1 and for protection class 5P10. C/Ts shall be capable of withstanding magnetic and thermal stresses due to short circuit faults as applicable. Terminals of C/Ts shall be paired permanently for easy identification of poles. C/Ts shall be provided with earthing terminals for earthing chassis, frame work and fixed part of metal casing (if any). Each C/T shall be provided with rating plate indicating:
    a. Name and make
    b. Serial number
    c. Transformation ratio
    d. Rated burden
    e. Rated voltage
    f. Accuracy class
2. CTs shall be mounded such that they are easily accessible for inspection, maintenance and replacement. Wiring for CT shall be with copper conductor FRLS PVC insulated wires with proper termination works and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner. Facilities for shorting terminal shall be provided.

6.3.10.5. Potential transformer

PT‘s shall conform to IS 3156 (Part I, II and III) in all respects. Primary and secondary circuit wiring star connected and voltage ratio shall be 11 kV /□3/110/□3 or 415/□3/110/□3 as specified in Schedule of Quantities. Class of accuracy shall be 1.0. Over voltage factor shall be 1.2

6.3.10.6. Measuring instruments

1. Direct reading electrical instruments shall conform to IS 1248 or in all respects. Accuracy of direct reading shall be 1.0 of voltmeter and 1.0 for ammeters. Other instruments shall have accuracy of 1.0. Meters shall be suitable for continuous operation between -10^{o} C and +45^{0}C. Meters shall be flush mounting and shall be enclosed in dust tight housing. The housing shall be of steel or

phenolic mould. Design and manufacture of meters shall ensure prevention of fogging of instrument glass. Pointer shall be black in colour and shall have Zero position adjustment device operable from outside. Direction of deflection shall be from left to right. Suitable selector switches shall be provided for ammeters and volt meters used in three phase system unless otherwise stipulated, 96 mm x 96 mm instrument shall be used. The rating type and quantity of meters, instruments and protective device shall be as per Schedule of Quantities /drawings. Ammeter on motor circuit shall be provided with suppressed scales to take care of shorting surges. 2. Ammeters

Digital type Ammeter of specified range to class 1.0 accuracy with necessary selector switches. Ammeters shall be manufacture and calibrated as per IS 1248. Ammeters shall normally be suitable for 5 A secondary of current transformers. Ammeters shall be capable of carrying substantial over loads during fault conditions. Ammeters of motor circuits shall be provided with suppressed scale to cater for starting current.

3. Voltmeters

Voltmeters shall be digital type range of 3 phase 415 volt voltmeters shall be 0-500. Volt meters shall be provided with protection MCB.

4. Watt meter

Wattmeter shall be of 3 phase digital type and shall be provided with a maximum demand indicator if required.

5. Power factor meters

3 phase power factor meters shall be digital type with current and potential coils suitable for operation with current and potential transformers provided in the panel. Scale shall be calibrated for 50% lag - 100% - 50% readings. Phase angle accuracy shall be +4^{0}.

6. Energy and reactive power meters

Trivector meters shall be two element, integrating type, KWH, KVA, KVARH meters. Meters shall confirm to IEC 170 in all respects. Energy meters, KVA, and KVARH meters shall be provided with integrating registers. The registers shall be able to record energy consumption of 500 hours corresponding to maximum current at rated voltage and unity power factor. Meters shall be suitable for operation with current and potential transformers available in the panel.

6.3.10.7. Indicating lamps

Cluster LED type indicating lamps shall be provided for indication of phases and Breaker position as required in the schedule of quantities. Lamps shall be easily removed and replaced from the front of the panel by manual means not requiring the use of extractors.

6.3.10.8. Push buttons

Push buttons shall be of non-hygroscopic material, non-swelling and fitted to avoid any possibility of sticking. Contacts shall be of adequate strength and have a positive whipping action when in operation

6.4. Specifications for Manually Operated Fire Detection and Alarm System

General description:

6.4.1. Scope

This specification covers the supply, installation, testing and commissioning of the Fire Alarm Systems and generally comprise

1. Provision of Manual Call Points

2. Provision of Hooters
3. Local Control Unit for the System
4. Wiring between MCP, Hooter and Control Units to make the complete System

6.4.2. Standards and codes

All equipment and the installation shall be as per the relevant Indian Standards Specifications. Where these Standards do not exist, the relevant British Standards or any other internationally accepted Standard shall apply.

6.4.3. Manual call points

Manual Call Points shall consist of a push button switch housed in a dust tight sheet steel enclosure of 1.5 mm thick sheet to manually initiate audio visual alarms. The front shall be sealed with a breakable glass cover fixed in such a way that the actuating push button is kept depressed as long as the glass is intact and released automatically when the glass is broken. The front face of the Manual Call Box shall have an area not less than 5000 sq mm and the element shall have an exposed area of not less than 1600 sq mm in the shape of a square or a rectangle.

A small steel hammer shall be attached to the assembly with a steel chain to facilitate breaking of the glass front. The Manual Call Box shall be suitable for surface or recessed mounting as required. The words "IN CASE OF FIRE BREAK GLASS" 5 mm high shall be painted in red on the front face.

6.4.4. Hooter

Electronic audio alarm sirens shall be suitable for operation on the DC supply of the System and will be actuated from the Main Control Panel in the event of a fire. These shall have a two tone modulated alarm signal for continuous service with an output of 89 dB at a distance of 3 meters.

6.4.5. Main control panel

6.4.5.1. General

The Main Control Panel (MCP) shall be located at entrance and shall form the nerve centre of the total System.

6.4.5.2. Constructional features

The MCP shall be metal enclosed, sheet steel cubicle pattern, dead front, floor/wall mounting type as required and suitable for indoor mounting.

The MCP shall be dust and vermin proof. Synthetic rubber gaskets shall be provided on all covers and doors to render the joints dust and vermin proof. All doors shall be lockable.

The MCP shall be fabricated from 2.0 mm CRCA thick sheet steel and shall be folded and braced to provide a rigid support. Joints shall be seam welded.

6.4.5.3. Internal wiring

All internal wiring shall be with 1.5 sq mm PVC insulated copper conductor wires colour coded and labelled with ferrules for easy identification. The wiring shall be properly bunched and harnessed. The wiring shall be done in a manner such that it is readily accessible from the front for maintenance.

6.4.5.4. Sheet steel treatment and painting

Sheet steel materials used in the construction of the Panels should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognized phosphating process. The steel work shall then receive two coats of filler oxide primer before final painting.

All sheet steel shall after metal treatment be spray or powder painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns.

6.4.6. Test certificates

Type test certificates from a recognized independent agency shall be furnished for all the equipment. The equipment shall comply with the requirements of the Indian, International Standards, Fire Insurance Authorities and all National and Local Regulations in force.

6.5. Specifications for HVAC

6.5.1. Section - I: Air Handling Units (Suitable For Working With VRV/VRF)

6.5.1.1. Scope

It includes the supply, erection, testing and commissioning of double skin type air handling units, conforming to these Specifications and as detailed in the Schedule of Quantities and approved shop drawings.

6.5.1.2. Type

The air handling units shall be double skin construction, horizontal or vertical type through blow though type comprising of various sections i.e. filter section/s coil section/s and fan section. Mixing box (with dampers), (wherever the return air, or and fresh air are ducted) as included in schedule of quantities and shown in shop drawings.

6.5.1.3. Capacity

The air handling capacities in terms of air delivery, maximum motor horse power and static pressure shall be as identified in Schedule of Quantities and in shop drawings.

6.5.1.4. Casing

1. Double skinned panels of AHUs shall be 23mm thick for recirculation type AHUs & *46* mm thick for TFA AHUs & outdoor type AHUs. These shall be made of galvanized steel, pressure injected with foam insulation (density 40 kg/m^3) These panels shall be fixed to minimum 1.5 mm thick aluminium alloy structural framework with stainless steel screws. Outer sheet of double skinned panels shall be made of pre-plasticized galvanized sheet, and inner sheet of plain G.I. Sheet, both inner & out shafts shall be of 24 gauge.
2. The entire framework shall be mounted on an aluminium alloy or galvanized steel channel base as per manufacturer‘s design. Sealing of panels to the frame work shall be through heavy duty `O‘ ring gaskets held captive in the framed extrusion. All panels shall be detachable or hinged. Handles for panels shall be made of hard nylon and shall be operational from both inside and outside of the unit. Units supplied with various sections shall be suitable for onsite assembly gaskets shall be continuous & concealed.
3. AHU shall have hinged, access door in the fan section and also in filter section where filters are not accessible from outside. Access doors shall be part of double skinned panels.
4. AHU shall have 18 gauge stainless steel sheet condensate drain pan. It shall be isolated from bottom floor panel through insulation as per manufacturer‘s standards.

6.5.1.5. Mixing Box

Mixing box shall be provided to AHUs specified in Schedule of Quantities and shall be along with fresh air and return air dampers.

6.5.1.6. Thermal Break Profile

TFA AHUs & AHUs with mixing box having ducted return air, shall be provided with thermal break profile whatever or not indicated in schedule of quantities.

6.5.1.7. Dampers

Dampers provided at supply air inlet, return air & fresh air intake shall be opposed blade type made of double skinned aerofoil aluminium sections, assembled within a rigid extruded aluminium alloy frame work with gasket. All linkages shall be made of aluminium or nylon, having Teflon bushes. Dampers shall be provided with a Bakelite knob for locking the damper blades in position. Linkages shall be extended wherever specified for motorized operation. Damper frames shall be manufacturer in such a way that

blades never wrap. Air leakage in the closed position of dampers shall not exceed 1.5% of the total flow rate at the maximum design air total pressure.

6.5.1.8. Motor and Drive

AHU fan motors shall be energy (TEFC) efficient *(IE-2) suitable for* 415±10% volts, 50 cycles, three phase, supply motor shall be totally enclosed fan-cooled class F, with IP-55 protection. Motors shall be designed for quiet operation and motor speed shall not exceed 1440 rpm. Drive forwarded to fan shall be provided through pulley belt-drive arrangement. Belts shall be oil-resistant type.

6.5.1.9. Fan

1. AHU fans as per schedule of quantities either be forward inclined blades (suitable for static pressure up to 70 mm Wg) or backward inclined blades (for static pressure above 70 mm Wg). AHU fan motor driven by variable frequency drive shall have backward inclined irrespective of static pressure casing of fan shall be made of galvanized steel sheet. Fans shall be selected for minimum efficiency of 75%. Fan wheels shall be made of galvanized steel. Fan shaft shall be of carbon steel, supported in self-aligning plummer block, grease lubricated bearings. Fan wheels be tested and balanced dynamically. Fan motor assembly shall be statically and dynamically balanced as per relevant ISO/AMCA standard. Computerized fan selection print outs shall be submitted along with the offer/ technical submittal.
2. Motors shall be totally enclosed, fan cooled, to be class `F' insulation. It shall be mounted inside the AHU casing on slide rails for easy belt tensioning. Motors drive shall be heavy duty V-belt, having constant pitch, suitably selected for rated motor horsepower. Both fan and motors assemblies shall be mounted on aluminium alloy or galvanized steel base frame, as per the manufacturer's standard.
3. Anti-vibration manuals consisting of spring & rubber combinations shall be provided for isolating the unit casing against vibration transmission. Flame retardant, waterproof silicone rubber impregnated flexible connection shall be provided at the fan discharge.

6.5.1.10. DX Coil

1. The Dx coil section shall have 9.5 mm dia copper tubes minimum of 30 G thick & .43 mm inner groove tube and 0.15 mm thick aluminium fins firmly bonded to copper tubes assembled in zinc coated steel frame. Face and surface area shall be such as to ensure rated capacity from each unit and such that air velocity across each coil shall not exceed 2.54 M/sec. An appropriate panel of the coil section shall incorporate factory made openings for coil inlet & outlet connections. The coils shall be mounted over an adequately sized condensate drain pan. Particular, care shall be taken to ensure that condensate is drained totally without leaving any stagnant pools anywhere in the unit. Each coil shall be factory tested with 500-600 Psi. Tube shall be mechanical expanded for minimum thermal contact resistance with fins Fin spacing shall be 11 to 12 fins per inch. Flanges of resilient isolation material shall be provided both at the inlet and outlet connections of all Dx coils with necessary bushes of similar material to minimize transmission of vibration to connected piping. Coil shall have automatic air vents, the vent outlets being piped to the drain pan with copper pipe. Coil performance shall be rated in accordance with ARI standard 410.
2. The casing/frame of coil shall be heavy duty Stainless Steel. Coil shall be design with intertwined type if the multiple outdoor connected to single coil. Expansion kit & outdoor unit from manufacturer.

6.5.1.11. Filters

Each AHU shall be supplied with a factory assembled filter section. This shall be provided with washable synthetic type air filters having anodized aluminium frame. The filters shall have minimum 90% efficiency down to 10 microns. The media shall be supported with HDP mesh on one side and aluminium mesh on

other side. Filter banks shall be easily accessible and designed for easy withdrawal and renewal of filter cells. Filter framework shall be and constructed from aluminium alloy and should be fully sealed.

6.5.1.12. Isolators

Vibration isolators shall be provided with all air handling units as per manufacturer's recommendation. Vibration isolators shall be cushy foot mounting type. Else these shall be of neoplane pads 2 Nos. each having minimum thickness of 25mm sandwiched in GI sheet. Minimum vibration isolation efficiency shall be 90%.

6.5.1.13. Fresh Air Intakes

Anodized extruded aluminium construction fresh air louvers with bird screen pre filters and dampers shall be provided in the external masonry walls of the air handling unit rooms. Fresh air dampers shall be of the interlocking, opposed-blade louver type. Blades shall be made of extruded aluminium construction and shall be rattle-free. Dampers shall be similar to those specified in —Air Distribution‖. Fresh air fans and fresh air intakes shall be as per the requirements of Schedule of Quantities.

6.5.1.14. Performance Data

AHU selection shall be for the lowest operating noise level. Fan performance curve and power consumption data, with operating point indicated shall be submitted in technical submittals which shall be verified at the time of testing and commissioning of the installation.

6.5.1.15. Painting

Shop coats of paint that have become marred during shipment or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with paint to match the finish over the adjoining shop painted surface.

6.5.1.16. Testing

Cooling / heating capacity of each air handling unit shall be computed from the measurements of air flow and dry and wet bulb temperatures of air entering and leaving the coil. Flow measurements shall be by voltmeter anemometer and temperature measurements by accurately calibrated mercury-inglass thermometer. Computed results shall conform to the specified capacities and quoted ratings. Power consumption shall be measured from w.r.t incoming voltage and input current.

6.5.2. Section – II: Ventilation Fans

6.5.2.1. Inline & Propeller Fans Scope

1. The scope of this section comprises the supply, installation, testing and commissioning of centrifugal and inline fans conforming to these specifications and in accordance with the requirement of drawings and as per BOQ. Type
2. Centrifugal and inline fans shall be of type as indicated in drawings and as per BOQ. Inline Fans
3. Inline fan shall incorporate DIDW direct driven centrifugal fan with TEFC (IP-21/44) motor or as per OEM. It should be preferably AMCA certified. The Fan RPM should not be exceed 1440. The fan assembly shall be enclosed in a sheet metal housing of 22 gauge GSS and with necessary inspection cover with proper gasket assembly. The fan material shall be galvanized sheet steel. Flanges shall be provided on both sides of inline fan to facilitate easy connection. Flexible antivibration joints shall be provided to arrest vibration being transferred to other Equipment connected to inline fan. Motor shall be single phase/three phase as per duty conditions.
4. All single-phase fans shall be provided with speed regulators while all three phase fans shall be provided with opposed blade dampers in GSS construction at fan outlet for air balancing.

   Propeller Fans
5. Propeller fans shall be direct driven, three or four blade type mounted on a steel mounting plate with orifice ring.

6. Mounting plate shall be of steel construction, square with streamlined venturi inlet coated with baked enamel paint. Mounting plate shall be of standard size, constructed of 12 to 16 gauge steel sheet depending upon the fan size. Orifice ring shall be correctly formed by spinning or stamping to provide easy passage of air without turbulence and to direct the air stream.
7. Fan blades shall be constructed of aluminium or glass reinforced polypropylene. Fan hub shall be of heavy welded steel construction with blades bolted to the hub fan blades and assembly shall be statically and dynamically balanced
8. Shaft shall be of steel accurately ground and shall not pass through first critical speed through entire range of specified fan speed.
9. Motor shall be standard permanent split capacitor of shaded pole for small sizes, totally enclosed with pre-lubricated sleeve or ball bearings, designed for a quiet operation with a maximum speed of 1000 RPM for fans 60 cm dia. or larger and 1440 RPM for fans 45 cm dia. and smaller. Motors for larger fans shall be suitable for 415 ± 6% volts. 50 cycle 3-phase power supply and for smaller fans shall be suitable for 220 ± 6% volts, 50 cycles single-phase power supply. Motors shall be suitable for horizontal or vertical service as indicated in drawings and as per requirements.
10. Propeller fans shall be provided with following accessories: -
    a. Wire guard and bird-screen
    b. Gravity louvers at outlet
    c. Regulator for controlling fan speed for single-phase fan motor.
    d. Single-phase preventors for 3 phase fans.
    e. Wiring between regulator and fan motor including termination at both ends.

    Performance Data
11. All fans shall be selected for the lowest operating noise level. Capacity rating, power consumption with operating points clearly indicated shall be submitted and verified at the time of testing and commissioning of installation. Testing
12. Capacity of all fans shall be measured by an anemometer. Measured airflow capacities shall conform to the specified capacities and quoted ratings, power consumption shall be computed from measurements of incoming voltage and incoming current.
13. The Fans shall be preferably AMCA certified. Also, it should be UL & FM/EN approved.

6.5.2.2. Centrifugal Fan Sections (AMCA certified) Scope

1. The scope of this section comprises the supply, installation, testing and commissioning of ventilation fan sections conforming to these specifications and in accordance with the requirement of drawings and DPR. Fan Outlet velocity shall not exceed 610 meters per minute.

   Type
2. Ventilation fan sections shall be complete with Centrifugal Fans, belt driven fans complete with motor drive and housing with weatherproof cowl.

   Unit construction

   Housing
3. The housing shall be fabricated out of 16 gauge steel sheet and shall have flange to be connected to duct. The discharge cowl shall be hinged along one edge for easy access to motor and drive, for inspection and maintenance. The entire assembly shall be weatherproof and

provided with 18 gauge galvanized steel mesh bird screen of 6 mm size on all discharge cowls around the outlet areas. Shaft shall be constructed of steel, turned, ground & polished. Fan

4. Fan shall be forward / backward inclined wheel type designed for maximum efficiency, minimum turbulence and quiet operation. Fan shall be statically and dynamically balanced. Fan shall conform to specifications as given in specification No.SPC/CF – PF/01 Motor
5. Motors shall be suitable for 415 +- 10% volts, 50 CPS, 3 Phase AC supply totally enclosed fan cooled motor provided with class ‗F' insulation& IE-3 class efficiency. Motor shall be designed for quiet operation and motor speed shall not exceed 1440 RPM. Drive to fan shall be through belts. Back draft Damper
6. Where called for in BOQ, the ventilation fan section shall be provided with a rattle free back draft damper to prevent air from re-entering the fan when fan is not in operation, thus sealing completely in closed position. Damper shall be chatterproof under all conditions. Vibration isolation
7. The motor and fan assembly shall be isolated from base through Dunlop/Resistoflex vibration isolators.

   Performance data

8. All fans shall be selected for the lowest operating noise level. Capacity rating, power consumption with operating points clearly indicated shall be submitted and verified at the time of testing and commissioning of installation. Testing
9. Capacity of all fans shall be measured by an anemometer. Measured airflow capacities shall conform to the specified capacities and quoted ratings, power consumption shall be computed from measurements of incoming voltage and incoming current.
10. The Fans shall be AMCA certified. Also, it should be UL & FM/EN approved. Sound attenuators with/without baffles to reduce noise generated at source itself wherever feasible. **6.5.2.3. Axial flow fan sections (AMCA certified)** Scope

1. This section covers the technical requirements for manufacture, testing at works, delivery at site, testing after installation, commissioning of axial flow fan equipment for ventilation and exhaust system. Their location shall be as given in DPR and drawings.
2. The fans shall be complete with all the accessories required for proper installation and performance consisting mainly of the following: -
3. Suction and discharge side flanges and counter flanges suitably drilled, complete with bolts & nuts, direct driving electric motor, suspension hangers (for ceiling hung fans only) for vibration isolation (rubber in shear type). Any structural steel and hardware required for assembly, installation, supporting of fan or accessories. 2 mm thick flexible connectors, fire resistant type at suction and discharge end, Foundation bolts and vibration isolators (in case of floor mounting only).Gravity louvers

   Applicable specifications standards and codes.

4. Documents listed below should be read along with the technical data given in the BOQ and shall be applicable to the material, manufacture, testing and installation of axial flow fans and accessories.
   a. I.S.S.: 3588 – 1986; specifications for electric axial flow fans.
   b. ANSI/ASHRAE: standard 51

c. ANSI/AMCA: standard 210 & 300 for preparing performance curves, charts and testing of fans for air and sound performance

d. IS-2312 – Propeller type A.C ventilation fans

e. BS – 848/ ACMA Tested – Methods of performance test for fans

Design & manufacturing

Fan and Components

5. The fan shall be designed to handle the quantity of air against the static pressure and at conditions indicated in the technical data. The fan shall have 70% efficiency at operating conditions and shall have performance characteristics to match the approved performance curves.
6. The unit shall be factory built to the highest standards to ensure rigidity, maximum mechanical and electrical reliability, quite, stable and vibration free operation at the prescribed conditions of flow, static and speed.
7. The casing shall be fabricated from heavy gauge sheet steel with suction and discharge ends flanged and complete with counter flanges, G.I. nuts and bolts. The flanges and counter flanges shall be matched and drilled suitably to receive flexible PVC connections. An inspection door with handle and neoprene gaskets shall be provided. Support brackets for ceiling suspension shall be bolted to the casing for connection to hanger bolts. Impeller & Blades
8. The impeller shall be cast aluminium; aerofoil type with well-balanced blades made from cast aluminium alloy or cast steel construction. Drive
9. The fan hub and blades shall be directly mounted on the shaft of a totally enclosed motor, rotor of fan motor shall be well balanced. The motor shall be TEFC, squirrel cage, IP 55 0– class H/F as per use, IE-3 class efficiency preferably and suitable for 415 +- 10% V, 50 HZ 3 phase AC power supply. The motor shall be dual speed wherever called for as per BOQ. The maximum motor speed shall be limited to 1450 RPM. Motor conduit box shall be mounted on exterior of fan casing and lead wires from motor to conduit box shall be protected from air stream by enclosing in a flexible metal conduit.
10. Technical Specifications: The firm shall submit the technical data and performance characteristics with operating points duly marked for approval prior to fabrication. The supplier shall supply the test certificates of all the fans.
11. General Requirements Static, dynamic balancing and vibration: the individual fan impeller, blades, motor shall be statically and dynamically balanced independently. After assembly the entire fan motor unit shall not give rise to any vibrations. The balancing shall be as per ISO: 1940 GR 6.3.
12. Noise Level: The tendered shall indicate the noise level generated by the fan/motor unit in terms of decibel units to be measured at 3M from the unit. This shall fall in line with best engineering standard and shall not be more than 80 db. Painting
13. All fans and their accessories shall be painted with two coats of suitable enamel paint after one coat of Red Oxide primer. Packing
14. The fans shall be dispatched in packed condition to avoid damage during transportation to site. Transit insurance for the fans shall be included in this offer. Inspection & testing

15. All fans shall be subjected to inspection and testing requirements as given below. The contactor shall be responsible for providing all inspection facilities and for conducting all tests at works and at site after erection.
16. The performance of the fan motor unit shall be tested by operating at design conditions. The following parameters will be tested vis-à-vis the approved performance curves.
17. Airflow capacity, Static head developed, BHP requirement, Vibration and noise level. The Fans shall be AMCA certified. Also, it should be UL & FM/EN approved. Sound attenuators with/without baffles to reduce noise generated at source itself wherever feasible.

6.5.3. Section – III: Air Distribution Alternate: I
(For Ducts Fabricated In Factory as Per "SMANCA" Standards)

6.5.3.1. Scope

The scope of this section comprises supply fabrication, installation and testing of all sheet metal / aluminium ducts, supply, and installation, testing and balancing of all grilles, registers and diffusers. All to be in accordance with these specifications and the general arrangement shown on the Drawings.

6.5.3.2. Duct materials

1. Raw materials: Galvanizing shall be Class VII – light coating of zinc, nominal 120gm/sq. m surface area and Lock Forming Quality prime material along with mill test certificates. In addition, if deemed necessary, samples of raw material, selected at random by owner's site representative shall be subject to approval and tested for thickness and zinc coating at contractor's expense.
2. Gauges, bracing by size of ducts: All ducts shall be factory fabricated from galvanized steel / aluminium of the following thickness, as indicated as below :

a. 2.2.1 For Ducts with external SP up to 250 Pa (ESP up to 25mmWg)

Rectangular Ducts G. S.	**Pressure 250 Pa**		
	Duct Section Length 1.2 m (4 ft.)		
Maximum Duct Size	**Gauge**	**Joint Type**	**Bracing Spacing**
1–500 mm	26	C&S Connector	Nil
501 – 750 mm	26	C&S Connector	Nil
751 – 900 mm	26	TDF Flange	Nil
901 – 1200 mm	24	TDF Flange	Nil
1201 – 1500 mm	22	TDF Flange	Nil
1501 – 1800 mm	22	TDF Flange	JTR or ZEE BAR
1801 – 2100 mm	20	TDF Flange	JTR or ZEE
			BAR
2101 – above	18	TDF Flange	JTR or ZEE BAR

OR

b. For Ducts with External SP up to 500 Pa (50mmWg)

Rectangular Ducts G. S.	**External Pressure 500 Pa**		
	Duct Section Length 1.2 m (4 ft.)		
Maximum Duct Size	**Gauge**	**Joint Type**	**Bracing Spacing**
1–400 mm	26	C&S Connector	Nil

401-700 mm	24	C&S Connector	Nil
701-900 mm	24	TDF Flange	Nil
901-1000 mm	22	TDF Flange	Nil
1001-1200 mm	22	TDF Flange	JTR or ZEE BAR
1201-2100 mm	20	TDF Flange	JTR or ZEE BAR
2101-above	18	TDF Flange	JTR or ZEE BAR

*Distance of reinforcement/bracing from each joint. Bracing material to be same as of material used for joining of duct sections.

For Aluminium Ducts Material Shall Be One Commercial Gauge Higher With 22 GAs Minimum 3.

For Round Ducts

Duct diameter mm	**up to 50 mm Wg static pressure (+ve)**		**51 – 250 mm Wg static pressure (+ve)**		**Upto 50 mm Wg static pressure (-ve)**	
	Spiral seam gauge	**Longitudinal seam gauge**	**Spiral seam gauge**	**Longitudinal seam gauge**	**Spiral seam gauge**	**Longitudinal seam gauge**
up to 650	26	24	24	22	24	22
651-900	24	22	22	20	22	20
901 – 1250	22	20	20	20	20	18
1251 – 1500	20	18	18	18	18	16
1501 – 2100	18	16	18	16	16	14

6.5.3.3. Fabrication standards & equipment

1. All duct construction and installation shall be in accordance with SMACNA standards. In addition ducts shall be factory fabricated utilizing the following machines to provide the requisite quality of ducts.

    a. Coil (Sheet metal in Roll Form) lines to facilitate location of longitudinal seams at corners/folded edges only, for required duct rigidity and leakage free characteristics. No longitudinal seams permitted along any face side of the duct.

    b. All ducts, transformation pieces and fittings to be made on CNC profile cutter for requisite accuracy of dimensions, location and dimensions of notches at the folding lines.

    c. All edges to be machine treated using lockformers, flangers and rollers for turning up edges.

    d. Kitchen exhaust ducting shall be with 16 G MS welded construction. Suitable access doors shall be provided at every 3m. Provision shall be made for firefighting agency to install duct mounted sprinklers at every 3m. Generally exhaust ducts shall have slope towards kitchen hood.

6.5.3.4. Duct construction

1. All ducts shall be fabricated and installed in workmanlike manner, conforming to relevant SMACNA codes.

    a. Ducts so identified on the Drawings shall be acoustically lined and insulated from outside as described in the section —Insulation‖ and as indicated in schedule of Quantities. Duct dimensions shown on drawings, are overall sheet metal dimensions inclusive of the acoustic lining where required and indicated in Schedule of quantities. The fabricated duct dimensions should be as per approved drawings and care should be taken to ensure that all connecting sections are dimensionally matched to avoid any gaps.

    b. Ducts shall be straight and smooth on the inside with longitudinal seams shall be airtight and at corners only which shall be either Pittsburgh or snap button as per SMACNA practice, to ensure air tightness.

    c. All ducts up to 75cms width within conditioned spaces shall have C&S connector. The internal ends of slip joints shall be in the direction of airflow. Care should be taken to ensure that Cleats are mounted on the longer side of the duct and Cleats on the shorter side. Ducts and accessories within ceiling spaces, visible from air-conditioned areas shall be provided with two coats of mat black finish paint.

    d. Changes in dimensions and shape of ducts shall be gradual (between 1:4 and 1:7). Airturns (vanes) shall be installed in all bends and duct collars designed to permit the air to make the turn without appreciable turbulence.

    e. Ducts shall be fabricated as per details shown on Drawings. All ducts shall be rigid and shall be adequately supported and braced where required with standing seams, tees, or angles, of ample size to keep the ducts true to shape and to prevent buckling, vibration or breathing.

    f. All sheet metal connection, partitions and plenums, required to confine the flow of air to and through the filters and fans, shall be constructed of 18 gauge GSS / 16gauge aluminium, thoroughly stiffened with 25mm x 25mm x 3mm galvanized steel angle braces and fitted with all necessary inspection doors as required, to give access to all parts of the apparatus. Access doors shall be not less than 45cm x 45cm in size.

    g. Plenums shall be shop/factory fabricated panel type and assembled at site. Fixing of galvanized angle flanges on duct pieces shall be with rivets heads inside i.e. towards GS sheet and riveting shall be done from outside.

    h. Self-adhesive Neoprene rubber / UV resistant PVC foam lining 5mm nominal thickness instead of felt, shall be used between duct flanges and between duct supports in all ducting installation.

6.5.3.5. Pre-insulated ducts (if indicated in Schedule of Quantities)

Pre-Insulated Ducting shall be fabricated from 20 mm thickness air duct panel sheet having dimensions of 3000 (Length) mm by 1200 (Width) mm and produced and Sandwiched with Polyisocyanurate (PIR) first quality insulating Foam having 35 Kg / m^3 density. The Ducting Sheet shall have Lacquered & Embossed Aluminium facing on both sides.

Insulating foam material shall be Expanded Rigid Polyisocyanurate foam having closed cell content not less than 95%, CFC/ HCFC free, Non Toxic, Non-combustible, zero ozone depletion, Zero Global Warming Potential and Non ignitable.

Ducting panels shall comply with following or equivalent standards and manufacturer should produce M1 & F1 certification for Fire & Toxicity test results.

1. BS 476: PART 6--Fire Propagation for Products
2. BS 476: PART 7--- Surface Flame Spread (Class 1)

3. Class O Fire Rating as per Building Regulation requirements.
4. Thermal Conductivity Coefficient at 10^0C--0.022 W/m. K
5. Smoke Opacity Index—less than 10
6. Rigidity class: 200000 Nm m^2/mm
7. Water vapour permeability of laminations = 0

All required accessories; Connecting Flanges, Invisible Bayonet, Adhesive, Sealant, Duct Supports shall be part of ducting work for fabrication of the HVAC ducting in Square, rectangle, radius, offset construction etc., appropriate sizes of Aluminium flanges with self-adhesive good quality gasket shall be provided as a joinery or connection of duct pieces.

Excellent quality Silicon Neutral Sealant of Approved make along with fire rated PVC corners shall be used for sealing of all joints & corners.

Complete ducting shall be installed incorporating duct supports such as galvanized angles, threaded rods, self-adhesive brackets, Etc. **Panel Specifications: --**

Description	**Internal Areas**	**External Areas of Building**
Dimensions of panel	3000 x 1200 mm	3000 x 1200 mm
Thickness of panel	20 mm	20/30 mm
Thickness of aluminum Laminations	60/60 microns	60/200 microns
Density of the foam	35 kg/m^3	35 kg/m3
Surface finish	Embossed/Embossed	Embossed/Embossed
Anti-rust lacquer	2 gm/m^2 both sides	2 gm/m^2 both sides

6.5.3.6. Installation practice

All ducts shall be installed generally as per tender drawings, and in strict accordance with approved shop drawings to be prepared by the Contractor:

1. The Contractor shall provide and neatly erect all sheet metal work as may be required to carry out the intent of these Specifications and Drawings. The work shall meet with the approval of Owner‘s site representative in all its parts and details
2. All necessary allowances and provisions shall be made by the Contractor for beams, pipes, or other obstructions in the building, whether or not the same are shown on the drawings. Where necessary to avoid beams or other structural work, plumbing or other pipes, and conduits, the ducts shall be transformed, divided or curved to one side (the required area being maintained) all as per the site requirements.
3. If a duct cannot be run as shown on the drawings, the contractor shall install the duct between the required points by any path available in accordance with other services and as per approval of owner‘s site representative.
4. All ductwork shall be independently supported from building construction. All horizontal ducts shall be rigidly and securely supported, in an approved manner, with hangers formed of galvanized steel wire ropes (as per clause 16.12) and galvanized steel angle/channel or a pair of brackets, connected by galvanized steel wire hangers under ducts, rigid supports may be provided at certain interval if need be**.** The spacing between supports should be not greater than

2.4 meter. All vertical ductwork shall be supported by structural members on each floor slab. Duct supports may be through galvanized steel insert plates or Toggle end wire fixing left in slab at the time of slab casting. Galvanized steel cleat with a hole for passing the wire rope hanger shall be welded to the plates. Trapeze hanger formed of galvanized steel wire rope using Gripple shall be hung through these cleats. Wherever use of metal insert plates is not feasible, duct support shall be through dash/anchor fastener driven into the concrete slab by electrically operated gun. Wire rope supports shall hang through the cleats or wire rope threaded studs can be screwed into the anchor fasteners.

5. Alternatively, if mentioned in the BoQ, all ductwork shall be independently supported from building construction. All horizontal ducts shall be rigidly and securely supported, in an approved manner, with trapeze hangers formed of galvanized steel rods and galvanized steel angle/channel or a pair of brackets, connected by galvanized steel rod under ducts**.** The spacing between supports should be not greater than 2.0 meter. All vertical ductwork shall be supported by structural members on each floor slab. Duct supports may be through galvanized steel insert plates left in slab at the time of slab casting. Galvanized steel cleat with a hole for passing the hanger rods shall be welded to the plates. Trapeze hanger formed of galvanized steel rods shall be hung through these cleats. Wherever use of metal insert plates is not feasible, duct support shall be through dash/anchor fastener driven into the concrete slab by electrically operated gun. Hanger rods shall then hang through the cleats or fully threaded galvanized rods can be screwed into the anchor fasteners.
6. Ducting over furred ceiling shall be supported from the slab above, or from beams after obtaining approval of Owner‘s site representative. In no case shall any duct be supported from false ceiling hangers or be permitted to rest on false ceiling. All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other contractor‘s work in the building.
7. Where ducts pass through brick or masonry openings, it shall be provided with 25mm thick insulation around the duct and totally covered with fire barrier mortar for complete sealing.
8. All ducts shall be totally free from vibration under all conditions of operation. Whenever ductwork is connected to fans, air handling units or blower coil units that may cause vibration in the ducts, ducts shall be provided with a flexible connection, located at the unit discharge. Flexible connections shall be constructed of fire retarding flexible heavy canvas sleeve at least 10cm long securely bonded and bolted on both sides. Sleeve shall be made smooth and the connecting ductwork rigidly held by independent supports on both sides of the flexible connection. The flexible connection shall be suitable for pressure at the point of installation.
9. Duct shall not rest on false ceiling and shall be in level from bottom. Taper pieces shall taper from top.

6.5.3.7. Dampers

1. Dampers: All duct dampers shall be opposed blade louver dampers of robust 16 G GSS construction and tight fitting. The design, method of handling and control shall be suitable for the location and service required.
2. Dampers shall be provided with suitable links levers and quadrants as required for their proper operation. Control or setting device shall be made robust, easily operable and accessible through suitable access door in the duct. Every damper shall have an indicating device clearly showing the damper position at all times.
3. Dampers shall be placed in ducts at every branch supply or return air duct connection, whether or not indicated on the Drawings, for the proper volume control and balancing of the air distribution system.

4. Pressure relief dampers: Pressure relief dampers shall be constructed with 18G Aluminium construction with parallel blade construction. Leafs shall be 100% air tight upon closure. Leafs shall be loaded with spring pressure of stiffness (k value) corresponding to set point pressure.
5. Non return damper (Back draft damper): Non return damper shall be constructed out of 16G GSS. Blades shall ensure 100% air leak proof performance on closure. Design shall ensure that no rattling noise is produced at design duty.

6.5.3.8. Fire & smoke dampers

1. All supply and return air ducts at AHU room crossings and at all floor crossings or as indicated in the drawings shall be provided with Motor operated Fire & smoke damper of at least 90 minutes rating. These shall be of multi-leaf type and provided with Spring Return electrical actuator having its own thermal trip for ambient air temperature outside the duct and air temperature inside the duct. Actuator shall have Form fit type of mounting, metal enclosure and guaranteed long life span. The dampers shall meet the requirements of NFPA90A, 92A and 92B. Dampers shall have a fire rating of 1.5 Hrs. in accordance with latest edition of UL555 and shall be classified as Leakage Class 2 smoke damper in accordance with latest version of UL555S. Each fire/smoke damper shall be AMCA licensed and bear the AMCA seal for air Performance. Pressure drop shall not exceed 7.5Pa when tested at 300m/min face velocity on 600x600mm size damper. Actuator shall be UL listed.
2. Each damper shall be supplied with factory mounted sleeve of galvanized steel of thickness as per SMACNA and of minimum 500mm long or as specified in schedule of quantities depending up on the wall thickness. The damper shall be fitted in to sleeve either using welding or selftapping screws. All welded joints shall be finished using heat resistance steel paint. UL listed and approved Silicon sealant shall be applied at all corners as well as at joints between damper frame and sleeve. Damper Frame shall be a roll formed structural hat channel, reinforced at corners, formed from a single piece of 1.6mm galvanized steel. Damper blades shall be air foil shaped (equivalent to 2.3mm thickness strength) roll formed using 0.8mm thick single piece of galvanized sheet. Bearings shall be of stainless steel fitted in an extruded hole in the damper frame. Blade edge seals shall be silicone rubber and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Side Jam seals of stainless steel and Top and bottom seals of galvanized steel shall be provided. All galvanized steel used shall be with minimum 180GSM Zinc coating bigger size Dampers shall be supplied in multiple modules of sizes not exceeding in dimensions of certified module, jack shafted together. Multiple actuators shall be provided for large dampers with higher torque requirements as prescribed in UL.
3. The electric actuator shall be energized either upon receiving a signal from smoke detector installed in AHU room supply air duct / return air duct. Electric Actuator of suitable Torque and as approved by UL shall be factory mounted and tested. The actuator shall be suitable for 24V AC supply. In addition actuator shall have elevated temperature rating of 250 deg.F. Electric Actuator shall have been energized hold open tested for a period of at least one year with no spring return failure. Each fire/smoke damper shall be equipped with a heat actuated release device which shall allow controlled closure of damper rather than instantaneous to prevent accident. (Electrical fusible link).The EFL shall allow the damper to reopen automatically after a test, smoke detection or power failure condition. The damper shall be equipped with a device to indicate OPEN and CLOSE position of Damper blades through a link mounted on the damper blade.
4. Each damper shall be provided with its own control panel, mounted on the wall and suitable for 240 VAC supply. This control panel shall be suitable for spring return actuator and shall have at least the following features:
    a. Potential free contacts for AHU fan ON/ Off and remote alarm indication.

b. Accept signal from external smoke / fire detection system for tripping the electrical actuator.

c. Test and reset facility.

d. Indicating lights / contacts to indicate the following status:

e. Power Supply On

f. Alarm

g. Damper open and close position

5. Actuators shall be mounted on the sleeve by the damper supplier in his shop and shall furnish test certificate for satisfactory operation of each Motor Operated Damper in conjunction with its control panel. Control panel shall be wall mounted type.
6. It shall be HVAC Contractor‘s responsibility to co-ordinate with the Fire Alarm System Contractor for correctly hooking up the Motor Operated Damper to Fire Detection / Fire Management System. All necessary materials for hooking up shall be supplied and installed by HVAC Contractor under close co-ordination with the fire protection system contractor.
7. HVAC Contractor shall demonstrate the testing of all Dampers and its control panel after necessary hook up with the fire protection / fire management system is carried out by energising all the smoke detectors with the help of smoke.
8. HVAC Contractor shall provide Fire retardant cables wherever required for satisfactory operation and control of the Damper.
9. HVAC Contractor shall strictly follow the instructions of the Damper Supplier or avail his services at site before carrying out testing and installation at site.
10. Fire/smoke damper shall be provided with factory fitted sleeves; however, access doors shall be provided in the ducts within AHU room in accordance with the manufacturer‘s recommendations.
11. The Contractor shall also furnish to the Owner, the necessary additional spare actuators and temperature sensor (a minimum of 5% of the total number installed) at the time of commissioning of the installation.

6.5.3.9. Fire dampers

1. Whenever a supply/return duct crosses from one fire zone to another, it shall be provided with approved fire damper of at least 1½ hour fire rating as per UL555/1995 tested by CBRI. This shall be curtain type fire damper.
2. Fire damper blades shall be one piece folded high strength 16 gage galvanised steel construction. In normal position, these blades shall be gathered and stacked at the frame head providing maximum air passage and preventing passing air currents from creating noise or chatter. The blades shall be held in position through fusible link of temp 70^{o} C. The HVAC contractor shall supply UL classified Fire Dampers meeting or exceeding the specifications. Fire Dampers shall be furnished and installed at locations shown in Drawings and as described in Schedule of quantities. Fire Dampers shall have a fire rating of 1.5/3 Hrs.as specified in BOQ, in accordance with latest edition of UL555. Each Fire damper shall be AMCA licenced and shall bear the AMCA seal for air performance.

   Damper shall be equipped with UL labelled Fusible Link with Temperature setting 165 or 212deg. F or as specified in Bill of quantities. Fire dampers shall have been tested to close under dynamic air flow conditions with pressure up to 1000 pa and velocities up to 10.2 m /sec. Fire damper shall be approved for Horizontal or vertical installation as may be required by the location shown in the drawings.

Damper Frame shall be a roll formed structural hat channel, reinforced at corners, formed from a single piece of 1.6mm galvanized steel. Damper blades shall be roll formed 3-v groove (1.6mmthick) or airfoil shaped in case of 3 Hrs. fire rating (equivalent to 2.3mm thickness strength) roll formed using 0.8mm thick single piece of galvanized sheet. Bearings shall be of stainless steel fitted in an extruded hole in the damper frame. All galvanized steel used shall be with minimum 180GSM Zinc coating bigger size Dampers shall be supplied in multiple modules of sizes not exceeding in dimensions of certified module jack shafted together.

Fire damper shall be equipped with an electric limit switch to indicate open and close position of the damper blades.

Fire Damper shall be installed in wall or floor opening using galvanized steel sleeve of minimum 435mm length of sheet thickness as per SMACNA and as per Installation instruction of Manufacturer.

3. In case of fire, the intrinsic energy of the folded blades shall be utilized to close the opening. The thrust of the suddenly released tension shall instantly drive the blades down and keep it down without the use of springs, weights or other devices subject to failure.
4. Fire damper sleeves and access doors shall be provided within the duct in accordance with the manufacturer‘s recommendation.
5. The contractor shall also furnish to the Owner, the necessary additional fusible links (spares), as recommended by the manufacturer, at the time of commissioning of the installation.

6.5.3.10. Supply and return air registers

Supply & return air registers shall be of either steel or aluminium sections as specified in schedule of quantities. Steel construction registers shall have primer Coat finish whereas extruded aluminium registers shall be either Anodised or Powder Coated as specified in Schedule of Quantities. These registers shall have individually adjustable louvers both horizontal and vertical. Supply air registers shall be provided with key operated opposed blade extruded aluminium volume control damper anodised in matt black shade.

The registers shall be suitable for fixing arrangement having concealed screws as approved by Architect. Linear continuous supply cum return air register shall be extruded aluminium construction with fixed horizontal bars at 15 Deg. inclination & flange on both sides only (none on top & bottom). The thickness of the fixed bar louvers shall be minimum 5.5 mm in front and 3.8 mm in rear with rounded edges. Flanges on the two sides shall be 20 mm/30 mm wide as approved by Architect. The grilles shall be suitable for concealed fixing. Volume control dampers of extruded aluminium anodised in black color shall be provided in supply air duct collars. For fan coil units horizontal fixed bar grilles as described above shall be provided with flanges on four sides, and the core shall be & suitable for clip fixing, permitting its removal without disturbing the flanges.

1. All registers shall be selected in consultation with the Architect. Different spaces shall require horizontal or vertical face bars, and different width of margin frames. These shall be procured only after obtaining written approval from Architect for each type of register.
2. All registers shall have a soft continuous rubber/foam gasket between the periphery of the register and the surface on which it has to be mounted. The effective area of the registers for air flow shall not be less than 66 percent of gross face area.
3. Registers specified with individually adjustable bars shall have adjustable pattern as each grille bar shall be pivotable to provide pattern with 0 to +45 degree horizontal arc and up to 30 degree deflection downwards. Bars shall hold deflection settings under all conditions of velocity and pressure.
4. Bar longer than 45 cm shall be reinforced by set-back vertical members of approved thickness.
5. All volume control dampers shall be anodised aluminium in mat black shade.

6.5.3.11. Supply and return air diffusers

Supply and return air diffusers shall be as shown on the Drawings and indicated in Schedule of Quantities. Mild steel diffusers/dampers shall be factory coated with rust-resistant primer. Aluminium diffusers shall be powder coated & made from extruded aluminium section as specified in schedule of quantities.

1. Rectangular Diffusers shall be steel/ extruded aluminium construction, square & rectangular diffusers with flush fixed pattern for different spaces as per schedule of quantities These shall be selected in consultation with the Architect. These shall be procured only after obtaining written approval from Architect for each type of diffuser.
2. Supply air diffusers shall be equipped with fixed air distribution grids, removable key-operated volume control dampers, and anti-smudge rings as required in specific applications, and as per requirements of schedule of quantities. All extruded aluminium diffusers shall be provided with removable central core and concealed key operation for volume control damper.
3. Linear Diffuser shall be extruded aluminium construction with removable core, one or two way blow type. Supply air diffusers shall be provided with volume control/ balancing dampers within the supply air collar. Diffusers for different spaces shall be selected in consultation with the Architect, and provided as per requirements of schedule of quantities. All diffusers shall have volume control dampers of extruded aluminium construction anodised in mat black shade.
4. Slot Diffuser shall be extruded aluminium construction multislot type with air pattern controller provided in each slot. Supply air diffusers shall be provided with Hit & Miss volume control dampers in each slot of the supply air diffusers. Diffusers for different spaces shall be selected in consultation with the Architect and provided as per requirement of Schedule of Quantities.
5. Data centers shall be provided with floor grilles. Grilles shall be of nominal size of 600mm x 600mm and shall be fitted in floor tile of false floor. Grille shall be with dampers for flow control. Grill shall be heavy duty 16G Aluminium and shall take care of human traffic load. Damper shall be operable in situ without requirement of removal of grille.

6.5.3.12. Fire rated ductwork

Ducting for kitchen exhaust & fire evacuation shall be fire rated as per following specifications.

1. All fire rated ductwork constructed for mechanical or dual ventilation/pressurization/basement car park/smoke extract systems and kitchen exhaust shall be fabricated from Lock Forming Quality grade prime Galvanized Steel Sheet, constructed to enhanced SMACNA American/DW144 European standard to either low, medium or high velocity/ pressure.
2. Test requirement of fire rated ductwork should be tested to BS476: Part 24 [1987] and ISO 6944 providing required fire rating for Stability and Integrity.
3. Stability: the ability of a duct, ductwork & the support system to remain intact & fulfill their intended function for a specified period of time, when tested to the requirements of BS476: Part 24 and ISO 6944.
4. Integrity: the ability of a duct or ductwork to remain free of cracks, holes or openings outside the compartment in which the fire is present for a specified period of time, when tested to the requirements of BS476 Part 24 ISO 6944.
5. Insulation: the ability of a duct or ductwork to maintain its separating function without developing temperatures on its external surface outside the compartment in which the fire is present, which exceeds, (i) 140^{O}C as an average value above ambient & or, (ii) 180^{O}C as maximum value above ambient at any point, when tested for a specified period of time to the requirements of BS476: Part 24 ISO 6944.
6. It‘s important that the fire rated ductwork has a smooth internal surface in order to minimize the pressure loss within the fire rated ductwork system thereby reduce the power requirements.

7. All fire rated ducts for Smoke Extract Duct shall have Stability / Integrity and Insulation for smoke temperatures up to 300^{O}C up to 1.5 hrs. restriction of the duct due to twisting or buckling after the fire test shall not cause 25% or more reduction in cross sectional area proven by certification from an independent test house.
8. Each duct shall have fire rated coating. Fire rated coating compound used for construction of fire rated ductwork shall be protected with minimum 0.7mm to 1mm nominal thickness tested to properties as per the requirements of BS 476: 6 & 7, including non-combustibility Class O and fire propagation - Class 1 surface spread of flame & materials in accordance with Building Regulations.
9. Fire duct to be tested / assessed to BS476: Part 24 for all sizes up to 25 meters x 3 meters cross-sectional area and fully certified to vertical and horizontal plane.
10. Fire rated duct fabricated to Method 3 of BS 5588: Part 9, factory produced. The coating compound shall be applied either offsite or onsite on the ground, dried and cured.
11. Fire duct expansion under fire conditions shall not exceed following,

    - At 430^{O}C an expansion of 0.006106mm per mm -
      At 600^{O}C an expansion of 0.00852mm per mm
    - At 1100OC an expansion of 0.01562mm per mm.

6.5.3.13. Braided (wire) rope support

Braided (Wire) Hangers shall be used to suspend all static mechanical, electrical and HVAC services.

Braided (Wire) Rope Hangers shall consist of a pre-formed wire rope sling with either a ferruled loop, permanently fixed threaded M8 stud, or permanently fixed nipple end with toggle, at one end or hook or eyelet or any other end fixture type or size as per manufacturer‘s recommendation. The end fixings and the wire must be of the same manufacturer. The system is secured and tensioned with a wire rope Hanger self-locking grip at the other end.

Only wire and/or supports supplied and/or approved, shall be used with the system.

1. Braided (Wire) Rope Hangers have been independently tested by Lloyds Register. APAVE, TUV,
   UL, CSA and SMACNA, approved by ULC and CSA and comply with the requirements of DW/144 and BSRIA – wire Rope Suspension systems. Wire rope is manufactured to BSEN 12385: 2002.
2. The contractor shall select the correct specification of wire Hanger to use for supporting each particular service from table 1 below. Each size is designated with a maximum safe working load limit.

The correct specification of Braided (Wire) Rope Hanger required is determined using the following formula.

Weight per meter of object suspended (kg) X distance between suspension points (m) = weight loading per Braided (Wire) Rope Hanger suspension point (kg).

The contractor shall select the correct length of Braided (Wire) Rope required to support the service. Lengths from 1-10m lengths. No in–line joints should be made in the rope.

Table. 1

size	minimum breaking load of Braided (Wire) Rope	Braided (Wire) Rope construction	tensile strength(Nmm2)	working load limit (kg/lbs)

No. 1	80kg/176 lbs	7 x 7 (6/1)	1770	0-10 kg / 0-22 lbs
No. 2	260kg/572 lbs	7 x 7 (6/1)	1770	10-45 kg / 23-100 lbs
No. 3	580kg/1276 lbs	7 x 7 (6/1)	1770	45-90 kg / 101-200 lbs
No. 4	1500kg/3300 lbs	7 x 19 (12/6/1)	1770	90-225 kg / 210-495 lbs
No. 5	2160kg/4752 lbs	7 x 19 (12/6/1)	1770	225-325 kg / 496-715 lbs

The standard range of Braided (Wire) Rope Hanger Kits shall be used which contains galvanized high tensile steel wire rope, the minimum specification is as above and shall be manufactured to BS 302 (1987), BSEN12385.

Ducting Supports: All duct work shall be independently supported from building construction. All horizontal ducts shall be adequately secured and supported. In an approved manner, with trapeze Hangers formed of galvanized steel wire rope in a cradle support method under ducts at no greater than 2 meter centre. All vertical duct work shall be supported by structural members on each floor slab. Duct support shall be through dash / anchor fastener driven into the concrete slab by electrically operated gun. Hanger wire shall then hang around the ducting. Rigid supports shall be used in conjunction with wire rope hangers to assist with alignment of services. Rigid support must also be used in conjunction with wire rope hangers with duct work at each change of direction or connection. Support ducting in accordance with Schedule I.

Ducting over furred ceiling shall be supported from the slab above or from beams after obtaining approval of Construction manager/consultant. In no case shall any duct be supported from false ceiling Hangers or be permitted to rest on false ceiling. All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other Contractor‘s work in the building.

Piping Supports: Rigid supports shall be used in conjunction with wire rope hangers to assist with alignment of services. Rigid support must also be used in conjunction with wire rope hangers with pipe work at each change of direction or connection. For insulated pipe, provide protective sleeve to protect the entire circumference of the pipe insulation. All supports of pipe shall be taken from structural slab/wall by means of fastener. Support piping in accordance with Schedule II at the end of this Section.

Electrical Cable Tray/Raceway Supports: Y-Fit solution shall be used to a maximum width of 500mm tray. For Tray over 500mm cradle support method or independent Gripple supports must be taken as appropriate based on load. Rigid supports shall be used in conjunction with wire rope hangers to assist with alignment of services. Any other Gripple solution can be used based on manufacturer‘s recommendation on site conditions after prior approval.

Refer to manufacturers catalogue and installation guide for further technical information. **Comply with manufacturer's load ratings and recommended installation procedures.**

Schedule I: Duct Hanger Schedule

For ducts with external SP upto 250 Pa				**For ducts with external SP upto 500 Pa**		
Maximum Duct Size (mm)	**Gauge**	**Gripple Hanger No.**		**Maximum Duct Size (mm)**	**Gauge**	**Gripple Hanger No.**
1 - 751	26	2		1–600 mm	26	2
751-1000	26	2		601-750 mm	26	2
1001-1200	24	3		751-1000 mm	24	3
1201 - 1500	24	3		1001-1200 mm	22	4

1501 - 1800	22	4		1201-1300 mm	20	4
1801-2100	20	4		1301-1500 mm	18	4
2101-2700	18	4		1501-1800 mm	18	4
				1801-2100 mm	18	4
				2101-2250 mm	18	4

All supports shall be at 2400 mm interval.

Schedule II: Pipe Hanger Schedule

Pipe Size (mm)	Weight of pipe + fluid with insulation (kgs/rmts)	Weight of pipe + fluid per Rmt with sand cement plaster (kgs/rmts)	Spacings (pipe + fluid+insulation) between supports (mts)	Spacings (pipe + fluid+plaster) between supports (mts)	Total Weight of pipe + fluid with insulation (kgs/rmts)	Total Weight of pipe + fluid with sand cement plaster (kgs/rmts)	Gripple Hanger No. with insulation (kgs/rmts)	Gripple Hanger No. with sand cement plaster (kgs/rmts)
12-35	11.73	14	1.5	1.5	18	21	2	2
40-65	11.73	14	2	2	23	28	2	2
80-125	34.73	41.67	2	2	69	83.34	3	3
150-250	112	134	2	1.5	224	201	4	4
300 - 350	180	215	1.5	1.5	270	322.5	5	5
400-500	320	383	1.5	-	480	-	6	-

6.5.3.14. Documentation & measurements for ducting

All ducts fabricated and installed should be accompanied and supported by proper documentation viz:

1. Bill of material/Packing list for every duct section supplied.
    a. Measurement sheet covering each fabricated duct piece showing dimensions and external surface area along with summary of external surface area of duct gauge-wise.
    b. Each and every duct piece to have a tag number, which should correspond to the serial number, assigned to it in the measurement sheet. The above system will ensure speedy and proper site measurement and verification.
    c. Unless otherwise specified, measurements for ducting for the project shall be on the basis of centerline measurements described herewith
    d. Ductwork shall be measured on the basis of external surface area of ducts. Duct measurements shall be taken before application of the insulation. The external surface area shall be calculated by measuring the perimeter comprising overall width and depth, including the corner joints, in the center of each duct section, multiplying with the overall length from flange face to flange face of each duct section and adding up areas of all duct sections. Plenums shall also be measured in a similar manner.
    e. For tapered rectangular ducts, the average width and depth shall be considered for perimeter, whereas for tapered circular ducts, the diameter of the section midway between large and small diameter shall be adopted, the length of tapered duct section shall be the centerline distance between the flanges of the duct section.

f. For special pieces like bends, tees, reducers, branches and collars, mode of measurement shall be identical to that described above using the length along the centerline.

g. The quoted unit rate for external surface of ducts shall include all wastage allowances, flanges and gaskets for joints, nuts and bolts, hangers and angles with double nuts for supports, rubber strip 5mm thick between duct and support, vibration isolator suspension where specified or required, inspection chamber/access panel, splitter damper with quadrant and lever for position indication, turning vanes, straightening vanes, and all other accessories required to complete the duct installation as per the specifications. These accessories shall NOT be separately measured nor paid for.

2. Special Items for Air Distribution shall be measured by the cross-section area perpendicular to air flow, as identified herewith :

a. Grilles and registers - width multiplied by height, excluding flanges. Volume control dampers shall form part of the unit rate for registers and shall not be separately accounted.

b. Diffusers - cross section area for air flow at discharge area, excluding flanges. Volume control dampers shall form part of unit rate for supply air diffusers and shall not be separately accounted.

c. Linear diffusers - shall be measured by cross-sectional areas and shall exclude flanges for mounting of linear diffusers. The supply air plenum for linear diffusers shall be measured with ducting as described earlier.

d. Fire dampers - shall be measured by their cross sectional area perpendicular to the direction of air flow. Quoted rates shall include the necessary collars and flanges for mounting, inspection pieces with access door, electrical actuators and panel. No special allowance shall be payable for extension of cross section outside the air stream.

e. Flexible connection - shall be measured by their cross sectional area perpendicular to the direction of air flow. Quoted rates shall include the necessary mounting arrangement, flanges, nuts and bolts and treated-for-fire requisite length of canvas cloth.

f. Kitchen Hoods - shall be measured by their cross sectional area at the capture point of fumes, parallel to the surface of kitchen equipment. Quoted rates shall include the grease filters, provision for hood light, suspension arrangement for the hood, profile to direct the air to ventilation ducts and provision for removable drip tray.

6.5.3.15. Underfloor air distribution system

1. Round Floor Turbulent Flow Diffuser

a. Each diffuser shall produce a high induction turbulent vertical flow resulting in rapid temp erature equalization within the occupied zone.

b. The discharge airflow shall be adjustable from the face of the diffuser. Minimum flow limit shall be adjustable from 0% to 50% of maximum flow using a mechanical stop.

c. The adjustable diffuser face shall have a positive interlock with the mounting hardware to reduce the chance of accidental adjustment due to foot traffic.

d. The diffuser core shall consist of multiple radial slots with an incline angle of 30 degrees. The 8ǁ core shall be constructed of UL2043 Fire Rated Polyamide with permeating colour able to withstand maximum mechanical loading of 1300 lbs.

e. Round floor diffusers shall be installed with Ring Nut / fastening and shall include tamper protection to prevent unauthorized removal of the diffuser. Assembly shall include black polycarbonate distributor Basket with Damper device.

2. Round Floor Displacement Diffuser

a. Each diffuser shall produce a low induction horizontal flowresulting in a stratified zone te mperature distribution within the occupied zone.

b. The discharge airflow shall be adjustable from the face of the diffuser. Minimum flow limit shall be adjustable from 0% to 50% of maximum flow using a mechanical stop.

c. The adjustable diffuser face shall have a positive interlock with the mounting hardware to reduce the chance of accidental adjustment due to foot traffic. The 8ll core shall be const ructed of UL2043 Fire Rated Polyamide with permeating color able to withstand maximu m mechanical loading of 1300 lbs.

d. Round floor diffusers shall be installed with Ring Nut fastening and shall include tamper p rotection to prevent unauthorized removal of the diffuser. Assembly shall include black p olycarbonate distributor Basket with Damper device.

3. Round Floor Inclined Diffuser

a. Each diffuser shall produce a high induction turbulent flow by utilizing radial and circular discharge slots to create a discharge of 30 degrees to vertical resulting in rapid temperat ure equalization within the occupied zone.

b. The diffuser core shall consist of multiple radial slots and circular slots with an incline ang le of 30 degrees. The 8ll core shall be constructed of aluminum able to withstand maximu m mechanical loading of 2600 lbs. Round floor diffusers shall be installed with Ring Pres s Fit / Ring Claw fasteners and shall include tamper protection to prevent unauthorized re moval of the round diffuser.

c. Assembly shall include black polyamide distributor Basket with Damper device / Short Ba sket / Extra Short Basket with Damper Device. Round Floor diffusers shall be supplied wi th an RFB / RFBV boot mounted to the underside of the floor tile constructed of galvaniz ed steel.

6.5.3.16. Flexible Duct:

Insulated flexible duct should be UL 181 CLASS I AIR DUCT LISTED AND LABELLED WITH NFPA 90A & 90B ANDSEAL OF AIR DIFFUSION COUNCIL with double lamination of tough polyester which encapsulates steel helix wire forms the air tight inner core, double layer core wrapped in a multiple thickness of fiberglass wool with R Value 4.2, Green guard certification of fiberglass wool must. , Reinforced and sheathed in a rugged and durable tridirectionally reinforced matlized polyester jacket.

Flexible duct connections should be made as per UL181 listing procedure with proper flexible right forming brace connection allowing right connections for flexible duct into energy efficient. And Strapping the flexible duct connections with flexible duct strap ties.

6.5.3.17. Testing and balancing

After the installation of the entire air distribution system is completed in all respects, all ducts shall be tested for air leaks by visual inspection.

The entire air distribution system shall be balanced using an anemometer. Measured air quantities at fan discharge and at various outlets shall be identical to or less/excess than 5 percent in excess of those specified and quoted. Branch duct adjustments shall be permanently marked after air balancing is completed so that these can be restored to their correct position if disturbed at any time. Complete air balance report shall be submitted for scrutiny and approval, and four copies of the approved balance report shall be provided with completion documents.

6.5.4. Section IV: Insulation

6.5.4.1. Scope

The scope of this section comprises the supply and application of insulation conforming to these specifications.

6.5.4.2. Material

Elastomeric Nitrile Rubber

Insulation material for Duct & Pipe insulation shall be anti-microbial closed cell Elastomeric Nitrile Rubber. Thermal conductivity of the insulation material shall not exceed 0.038 W/m^{o}K or 0.212 BTU / (Hr-ft^{2}-^{o}F/inch) at an average temperature of 30 ^{o}C. Density of the nitrile rubber shall be 40-60 Kg/m^{3}. The product shall have temperature range of –40 ^{o}C to 105^{o}C. The insulation material shall be fire rated for Class 0 as per BS 476 Part 6: 1989 for fire propagation test and for Class 1 as per BS 476 Part 7, 1987 for surface spread of flame test. Water vapour permeability shall be not less than 0.024 perm inch (2.48 x 10^{-14} Kg/m.s.Pa i.e. µ=7000: Water vapour diffusion resistance). The material shall have approval from the Chief Fire Officer.

Thermal conductivity of the material shall not be affected by ageing, as per DIN 52616. The material must be tested for ageing effect in an accredited laboratory for a minimum period of five years to satisfy the ageing criteria.

The smoke density of the material as per AS-1530.3 shall not exceed 1. There shall be no toxicity in the emitted smoke, both under flaming and non-flaming conditions, as per AITM 3.000 (1993).

The insulation shall comprise of a single layer up to 19 mm thickness.

The material shall be antimicrobial as per ISO 22196, C1338 and ASTM G21-96. There shall be no growth of fungus and mold.

Insulation material for Duct Acoustic Lining shall be elastomeric Nitrile rubber.

Thickness of the insulation shall be as specified for the individual application. Each lot of insulation material delivered at site shall be accompanied with manufacturer‘s test certificate for thermal conductivity values, density, water vapour permeability and fire properties**.** Samples of insulation material from each lot delivered at site may be selected by Owner‘s site representative and gotten tested for thermal conductivity and density at Contractor‘s cost. Adhesive used for sealing the insulation shall be non-flammable, vapour proof adhesive strictly as per manufacturer‘s recommendations.

Ducting insulation thickness shall be as per table below.

Elastomeric Nitrile Rubber

Ducting position	**Thk. for non-coastal places**	**Thk. for coastal places**
SA duct in RA path	13mm	19mm
Ducted return air system	SA duct: 19mm RA duct: 13mm	SA duct: 25mm RA duct: 19mm
Both SA& RA exposed	Both 25mm	Both 25mm

6.5.4.3. Duct acoustic lining

Insulation material for Duct Acoustic Lining shall be elastomeric Nitrile rubber.

Material shall be engineered Nitrile Rubber open cell foam. The material should be fibre free. The density of the same shall be within 140-180 Kg/m^3. It should have antimicrobial product protection, and should pass Fungi Resistance as per ASTM G 21 and Bacterial Resistance as per ASTM E 2180. The material should have a thermal conductivity not exceeding 0.047 W/m.K @ 20 Deg. C . The material should withstand maximum surface temperature of +85^{0}C and minimum surface temperature of -20^{0}C. The material should conform to Class 1 rating for surface spread of Flame in accordance to BS 476 Part 7 & UL 94 (HBF, HF 1 & HF 2) in accordance to UL 94, 1996. The insulation should pass Air Erosion Resistance Test in accordance to ASTM Standard C 1071-05 (section 12.7). Thickness of the material shall be as specified for the individual application. The insulation should be installed as per manufacturer's recommendation. The adhesive shall be specially formulated for the Duct insulation application and supplied by insulation manufacturer. The adhesive shall be Solvent based rubber insulation adhesive, free from benzene. Ducts so identified and marked on Drawings and included in Schedule of Quantities shall be provided with acoustic lining of thermal insulation material for a distance of minimum 5 meters (or 30% of the duct length whichever is more).

Installation Procedure

The inside surface for the ducts shall be covered with adhesive recommended by the manufacturer. Cut Foamed sheets into required sizes apply adhesive on the foam and stick it to the duct surface

6.5.4.4. Duct insulation

External thermal insulation shall be provided as follows:

The thickness of nitrile rubber shall be as shown on drawing or identified in the schedule of quantity. Following procedure shall be adhered to:

Duct surfaces shall be cleaned to remove all grease, oil, dirt, etc. prior to carrying out insulation work. Measurement of surface dimensions shall be taken properly to cut closed cell elastomeric rubber sheets to size with sufficient allowance in dimension. Cutting of nitrile rubber sheets shall be done with adjustable blade to make 90^0 cut in thickness of nitrile rubber sheet. Hacksaw or blades are not acceptable tools for cutting the insulation.

Material shall be fitted under compression and no stretching of material shall be permitted. A thin film of adhesive shall be applied on the back of the insulating material sheet and then on to the metal surface. When adhesive is tack dry, insulating material sheet shall be placed in position and pressed firmly to achieve a good bond. All longitudinal and transverse joints shall be sealed by providing 6 mm thick 50 mm wide nitrile rubber tape. The adhesive shall be strictly as recommended by the manufacturer.

6.5.4.5. Piping insulation

All chilled water, refrigerant, and condensate drain piping shall be insulated in the manner specified herein. Before applying insulation, all pipes shall be brushed and cleaned. All MS pipes shall be provided with a coat of zinc chromate primer. Thermal insulation shall be applied as follows or as specified in drawings or schedule of quantity:

Pipe nominal bore	**Thk. for non-coastal places**	**Thk. for coastal places**
15mm – 25mm	19mm	25mm
32mm – 80mm	25mm	32mm
100mm – 400mm	32mm	38mm
Above 400mm	45mm	45mm

Insulating material in tube form shall be sleeved on the pipes. On piping, slit opened tube from insulating material shall be placed over the pipe and adhesive shall be applied as suggested by the manufacturer. Adhesive must be allowed to tack dry and then press surface firmly together starting from butt end and working towards center. Wherever flat sheets shall be used it shall be cut out in correct dimension using correct tools. Scissors or Hacksaw-blade shall not be allowed. All longitudinal and transverse joints shall be sealed as per manufacturer recommendations. All longitudinal and transverse joints shall be sealed by providing 6 mm thick, 50 mm wide nitrile rubber tape. The adhesive shall be strictly as recommended by the manufacturer. The insulation shall be continuous over the entire run of piping, fittings and valves. All valves, fittings, joints, strainers etc. in chilled water piping shall be insulated to the same thickness as specified for the main run of piping and application shall be same as above.

Valves bonnet, yokes and spindles shall be insulated in such a manner as not to cause damage to insulation when the valve is used or serviced. Manufacturer's installation manual shall be submitted and followed for full compliance. All insulation work shall be carried out by skilled workmen specially trained in this kind of work. All insulated pipes shall be labeled (S.R. or R.R.) and provided with 300 mm wide band of paint along circumference at every 1200 mm for colour coding. Direction of fluid shall also be marked. Un-insulated MS pipes shall be painted throughout and direction of fluid marked. All painting shall be as per relevant BIS codes.

6.5.4.6. Protective coating over insulation

To provide mechanical strength and protection from damage all pipe / duct insulated with nitrile rubber as indicated in BOQ shall be covered All insulated chilled water piping shall be with 7mil woven fiber glass cloth to provide complete seal against air and moisture/resistance against mechanical impact, scratch and weather resistance.

6.5.4.7. Overdeck insulation

Overdeck insulation shall be done with 75 mm thick extruded polystyrene of density 45-48 kg/cm^3 & thermal conductivity of 0.21 Btu in / ft^2 hr^{o}F (at 24^{o}C as per ASTM C – 518). Minimum compressive strength as per ASTM D-2842 shall be 570 kPa water absorption as per ASTM D-2842 shall not be more than 1%.

Method of Application

1. Clean RCC slab and make it free from dust and other laitance matter.
2. Lay cement based water proofing on roof with a minimum slope of 1:100 and average thickness of 110 mm using brickbats of appropriate size and shape suitable to achieve the required slope laid over 15 mm thick waterproof c3ement mortar 1:4 and finished with 20 mm thick waterproof plaster wing cement mortar 1:4 and making false squares of 300 mm size including rounding off the junction of roof and parapet walls for a height of 300 mm with brickbats and 20 mm thick waterproof plaster and conducting necessary leakage / dampers tests, etc.
3. Lay 65 mm thick extruded polystyrene boards over prepared surface fixing with adhesive. Adhesive shall be strictly as per recommendations from manufacturer. 4. Lay 80 gsm geotextile fabric over insulation board
5. Lay 40 x 40 x 4 cm precast paver blocks.

(Note: If contractor is awarded work of waterproofing + overdeck insulation, follow all steps from (a) to (e). if contractor is awarded work of only overdeck insulation follow step (c) and (d). Rest will be done by Civil Contractor).

6.5.4.8. Underdeck insulation

Underdeck insulation shall be 50mm thick TF Quality expanded polystyrene (32 Kg/m^3) or 30mm thick phenotherm. Underdeck surface of ceiling shall be cleaned and made dirt free. Insulation panels shall be pasted on this surface with black CPRX compound. 28g wire net shall be tightened around insulation so

as to avoid any kind of sagging. Ends of net shall be overlapping by at least 25mm. Overlaps shall be Magnetic Bearinged with galvanized Magnetic Bearings to avoid rusting.

6.5.4.9. Sound attenuators

Attenuators shall be installed in ducts in accordance with requirements of drawings and as included in Schedule of Quantities.

Noise levels within conditioned spaces shall be not greater than those set out in schedule below:

1. Noise Level Design Criteria
    a. Offices — Acceptable Noise Levels (NC) - 30-35
    b. Office Corridor — Acceptable Noise Levels (NC) - 35-40
2. Attenuators shall be of steel construction with casings out of minimum 22 G galvanized steel. Acoustic fill shall be inert, non-hygroscopic, vermin proof, fibre glass of required density adequately protected against corrosion and covered with 26 gage perforated aluminium sheet. Attenuators shall be supplied complete with flanges.
3. Acoustic performance of the attenuators (net insertion loss) shall meet or exceed the values listed below :

Octave band centre frequency hz								
	63	125	250	500	1k	2k	4k	8k
Insertion loss db								
900 mm long attenuators	2	7	12	19	23	23	18	11
1500 mm long attenuators	6	10	18	30	42	34	23	14

4. The pressure drop values of the silencers shall be indicated for each duty.
5. Manufacturers shall submit a test certificate for acoustic and aerodynamic performance of the attenuators. Attenuators shall be tested in accordance with ACMA test methods/BS 4718 and insertion loss and self-generated noise for each octave band and pressure drop shall be stated in the schedule.

6.5.4.10. Measurement of insulation

Unless otherwise specified measurement for duct and pipe insulation for the project shall be on the basis of centre line measurements described herewith

1. Pipe Insulation shall be measured in units of length along the centre line of the installed pipe, strictly on the same basis as the piping measurements described earlier. The linear measurements shall be taken before the application of the insulation. It may be noted that for piping measurement, all valves, orifice plates and strainers are separately measurable by their number and size. It is to be clearly understood that for the insulation measurements, all these accessories including cladding, valves, orifice plates and strainers shall be considered strictly by linear measurements along the centre line of pipes and no special rate shall be applicable for insulation of any accessories, fixtures or fittings whatsoever.

2. Duct Insulation and Acoustic Lining shall be measured on the basis of surface area along the centre line of insulation thickness. Thus the surface area of externally thermally insulated or acoustically lined be based on the perimeter comprising centre line (of thickness of insulation) width and depth of the cross section of insulated or lined duct, multiplied by the centre-line length including tapered pieces, bends, tees, branches, etc. as measured for bare ducting.

6.5.5. Section V: Hanging Support System

6.5.5.1. Steel Wire Rope Hangers& Supports:

Wire Hangers shall be used to suspend all static HVAC Air Distribution services.

Wire Hangers should consist of a pre-formed wire rope sling with a range of end fixings to fit various substrates and service fixings, these include a ferruled loop, permanently fixed threaded M6 (or M8, M10) stud, permanently fixed nipple end with toggle, at one end or hook or eyelet, cladding hook, barrel, wedge anchor, eyebolt anchor or any other end fixture type or size as per manufacturers recommendation and design. The end fixings and the wire must be of the same manufacturer with several options available. The system should be secured and tensioned with a Hanger self-locking grip (double channel lock)at the other end. Once the grip is locked for safety purpose unlocking should only be done by using a separate setting key and should not be an integral part of the self-locking grip.Only wire and/or supports supplied and/or approved, shall be used with the system.

1. Wire Hangersshould have been independently tested by Lloyds Register. APAVE, TUV, CSA, Chiltern International fire, ADCAS, Intertek, ECA, and SMACNA, approved by CSA and comply with the requirements of DW/144 and BSRIA – wire Rope Suspension systems.Wire rope should be manufactured to BSEN 12385: 2002
2. The contractor shall select the correct specification of wire hanger to use for supporting each particular service from table 1 below.Each size is designated with a maximum safe working load limit (which incorporates a 5:1 safety factor).

The correct specification of wire hanger required is determined using the following formula.

Weight per meter of object suspended (kg) X distance between suspension points (m) = weight loading per Hanger suspension point (kg).

Where the installed wire rope is not vertical then the working load limit shall be reduced in accordance with the recommendations give in the manufacturer‘s handbook.

The contractor shall select the correct length of wire rope required to support the service. Lengths from 110m lengths. Specials can be made, check with manufacturer. No in–line joints should be made in the rope.

Table. 1

Wire (Gripple) Hanger Safe Working Loads		
size	**minimum breaking load of Wire Rope**	**working load limit (kg/lbs)**
No. 1	80kg/176 lbs	0-10 kg / 0-22 lbs
No. 2	260kg/572 lbs	10-45 kg / 23-100 lbs
No. 3	580kg/1276 lbs	45-90 kg / 101-200 lbs
No. 4	1500kg/3300 lbs	90-225 kg / 210-495 lbs
No. 5	2160kg/4752 lbs	225-325 kg / 496-715 lbs

No. 6	2500kg/5500 lbs	325-500 kg / 715-1100 lbs

The standard range of Hanger Kits should contain galvanized high tensile steel wire rope or stainless steel wire rope as per the application, the minimum specification is as above and should be manufactured to BS 302 (1987), BSEN12385. **Comply with manufacturer's load ratings and recommended installation procedures.**Note the testing is done to the minimum breaking load of the wire thus giving a minimum safety factor of 5: 1.

6.5.5.2. HVAC Supports

Gripple Hanger Supports are suitable for: Rectangular duct, Spiral Duct, Oval Duct, Fabric Duct, Desertification fans, Air Conditioning Units, Plenum Boxes, Fan Coil Units & Diffusers

1. Ducting Supports:

   All ductwork shall be independently supported from building construction. All horizontal ducts shall be rigidly and securely supported, in an approved manner, with hangers formed of galvanized steel wire ropes and galvanized steel angle/channel or a pair of brackets, connected by galvanized steel wire hangers under ducts, rigid supports may be provided at certain interval if need be**.** The spacing between supports should be not greater than 2.4 meter. All vertical ductwork shall be supported by structural members on each floor slab. Duct supports may be through galvanized steel insert plates or Toggle end wire fixing left in slab at the time of slab casting. Galvanized steel cleat with a hole for passing the wire rope hanger shall be welded to

   the plates. Trapeze hanger formed of galvanized steel wire rope using Gripple shall be hung through these cleats. Wherever use of metal insert plates is not feasible, duct support shall be through dash/anchor fastener driven into the concrete slab by electrically operated gun. Wire rope supports shall hang through the cleats or wire rope threaded studs can be screwed into the anchor fasteners. In case of PEB structure Loop and Catenary system can be used based on the site conditions as per approved suspension system drawings.

2. All horizontal ducts shall be adequately secured and supported. In an approved manner, with trapeze Hangers formed of galvanized steel wire rope in a cradle support method (refer to typical drawings) under ducts at no greater than 3000mmcentre, for 3001mm-above appropriate size angle along with neoprene pad in between the duct & MS angleshould be used with prior approval. All vertical duct work shall be supported by structural members on each floor slab. Duct support shall be through dash / anchor fastener driven into the concrete slab by electrically operated gun. Hanger wires shall then hang around the ducting.Rigid supports shall be used in conjunction with wire rope hangers to assist with alignment of services where recommended for by the manufacturer. Rigid support must also be used in conjunction with wire rope hangers with duct work at each change of direction or connectionor as per approved drawings. Support ducting in accordance with Schedule I at the end of this Section.Any other Gripple solution can be used based on manufacturer‘s recommendation on site conditions after prior approval. In cases of Spiral ducting the wire can be wrapped directly around the ducting without the need for a spiral ducting clamp for sizes above 1100 a cradle support should be provided, refer to manufacturer‘s recommendations.

3. Ducting over furred ceiling shall be supported from the slab above or from beams after obtaining approval of Construction manager/consultant. In no case shall any duct be supported from false ceiling Hangers or be permitted to rest on false ceiling. All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other Contractor‘s work in the building. All supports of pipe shall be taken from structural slab/wall by means of fastener.

   Catenary Supports: Refer to manufacturer‘s recommendations on Catenary supports with Cclip, special care should be taken with tensioning of the wire and angles at which the installation of services are made**.**

4. Stainless Steel Supports should be available for food, chemical and High Corrosion areas near coastlines.

   Refer to manufacturers catalogue and installation guide for further technical information.**Comply with manufacturer's load ratings and recommended installation procedures. Schedule I: Duct Hanger Schedule**

For ducts with external SP upto 250 Pa				**For ducts with external SP upto 500 Pa**		
Maximum Duct Size (mm)	**Gauge**	**Gripple Hanger No.**		**Maximum Duct Size (mm)**	**Gauge**	**Gripple Hanger No.**
1 - 750	26	1 or 2		1–600 mm	26	1 or 2
751-1000	26	2		601-750 mm	26	2
1001-1200	24	2 or 3		751-1000 mm	24	2 or 3
1201 - 1500	24	3		1001-1200 mm	22	3 or 4
1501 - 1800	22	3 or 4		1201-1300 mm	20	3 or 4
1801-2100	20	3 or 4		1301-1500 mm	18	4
2101-2700	18	4		1501-1800 mm	18	4
				1801-2100 mm	18	4
				2101-2250 mm	18	4 or 5
				2251-2400 mm	18	4 or 5
				2401-2700 mm	18	4 or 5

Notes: All supports are considered at 2400 mm interval in above table and may vary as per the design but should not be greater than 2400mm.

5. Desertification fans, Air Conditioning Units, Plenum Boxes, Radiant Panels, Heaters, Fan Coil Units, Diffusers, Cassette units.

   All units shall be adequately secured and supported in an approved manner using wire hanger suspension Y fit solution as per manufacturers‘ recommendation with prior approval.

   Rigid Supports:

   Rigid supports if required in conjunction with wire hangers shall be of steel, adjustable for height and Zinc chromate primer coated and finish coated black. Where supports and clamps are of dissimilar materials, a gasket shall be provided in between. If the MS angle at the bottom if required as per design should be as per following table:

Longer size of Duct	**Type of Joints**
Up to 750	25x25x3 mm L angle with M8 nuts & bolts
751-1000	25x25x3 mm L angle with M8 nuts & bolts
1001-1500	40x40x5 mm L angle with M8 nuts & bolts
1501-2250	50x50x5 mm L angle with M10 nuts & bolts
2251 & above	50x50x6 mm L angle with M10 nuts & bolts

All the supporting system should be supplied from same manufacturer.

7. Section 7: Draft Contract Agreement

THIS AGREEMENT made on the …….day of …….. 2018 at Noida, District Gautam Budh Nagar, Uttar Pradesh Between **Noida Metro Rail Corporation Limited** (Hereafter referred to as —NMRCǁ), a company incorporated under Companies Act 2013, vide corporate identification Number: U60231UP2014SGC066849 and having its registered office at **Block-III, 3rd Floor, Ganga Shopping Complex, Sector-29, Noida -201301, District Gautam Budh Nagar, Uttar Pradesh, India** *represented by …….. of the company, by virtue of his designation and authorization by* ***Shri ……., Managing Director, NMRC*** (hereinafter called as the —Purchaser"), which expression shall unless excluded by or repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns) of the one part,

AND

…….. having its registered office at **……**, represented by **……** (herein after called the **"Contractor",** which expression shall unless excluded by or repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns) of the other part.

WHEREAS the Purchaser desires that the Works known as the **"……."** should be executed by the Contractor, and has accepted a contract by the Contractor for the execution and completion of these Works.

The Purchaser and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement -

Reference:

(i) Tender No. …… Dated ……..
(ii) Bid Documents duly accepted and submitted by …… dated ……..
(iii) The Bidding Documents which include all the Sections specified below:
   a. Section 1: General Information
   b. Section 2: Terms of Reference
   c. Section 3: Instructions to Bidders
   d. Section 4: Qualification, Evaluation and Selection Process
   e. Section 5: Special Conditions of Contract
   f. Section 6: Technical Specifications
   g. Section 7: Draft Contract Agreement
   h. Section 8: Appendix to Form of Tender and Forms
   i. General Conditions to Contract (GCC)
   j. Condition of Contract on Safety, Health & Environment Management
   k. Amendment/ Modification, if any
(iv) Notice of Award (……) issued by NMRC
(v) Letter of Acceptance of NOA (……) given by …….. to NMRC (vi) Any other admitted correspondence documents between NMRC and the Bidder.

3. Price Schedule

NMRC shall be as quoted by the contractor as part of financial bid i.e. INR _____.
As per letter of acceptance no _____ dt _____.

4. The courts at District Gautam Budh Nagar, Uttar Pradesh shall have the exclusive jurisdiction to try all disputes arising out of this agreement between the parties.

5. In consideration of the payments to be made by the Purchaser to the Contractor as specified in this Agreement, the Contractor hereby covenants with the Purchaser to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract and Notice of Award issued. —**Any conditions, deviation, assumption, exclusion, suggestion of alternative clauses, request of amendments in conditions & specifications of work submitted by bidders along with his Technical Bid or Financial bid, which is different from the Tender Document, Corrigendum, Addendum uploaded by NMRC on the E-Tender Portal (http://etender.up.nic.in) and any other correspondence in this regard, shall not be treated as a part of the contract Agreement & shall not be binding upon NMRC in anyway whatsoever at any stage of work during execution or thereafter."**

6. The Purchaser hereby covenants to pay the Contractor in consideration of the execution and completion of the Works, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract and NOA.

IN WITNESS where of the parties hereto have caused this Agreement to be executed in accordance with the laws of India on the day, month and year specified above.

For and on behalf of the Contractor Signature of the authorized official	For and on behalf of the Purchaser Signature of the authorized official
Name of the official	**Name of the official**
Stamp/Seal of the contractor	Stamp/Seal of the Purchaser
In the presence of:	In the presence of:
Sign of Witness 1_____	Sign of Witness 1_____
Name_____	Name_____
Address_____	Address_____
_____	_____
Sign of Witness 2_____	Sign of Witness 2_____
Name_____	Name_____

Address_____ Address_____

_____ _____

8. Section 8: Appendix to Form of Tender and Forms

8.1. Appendix 1: Metro Alignment

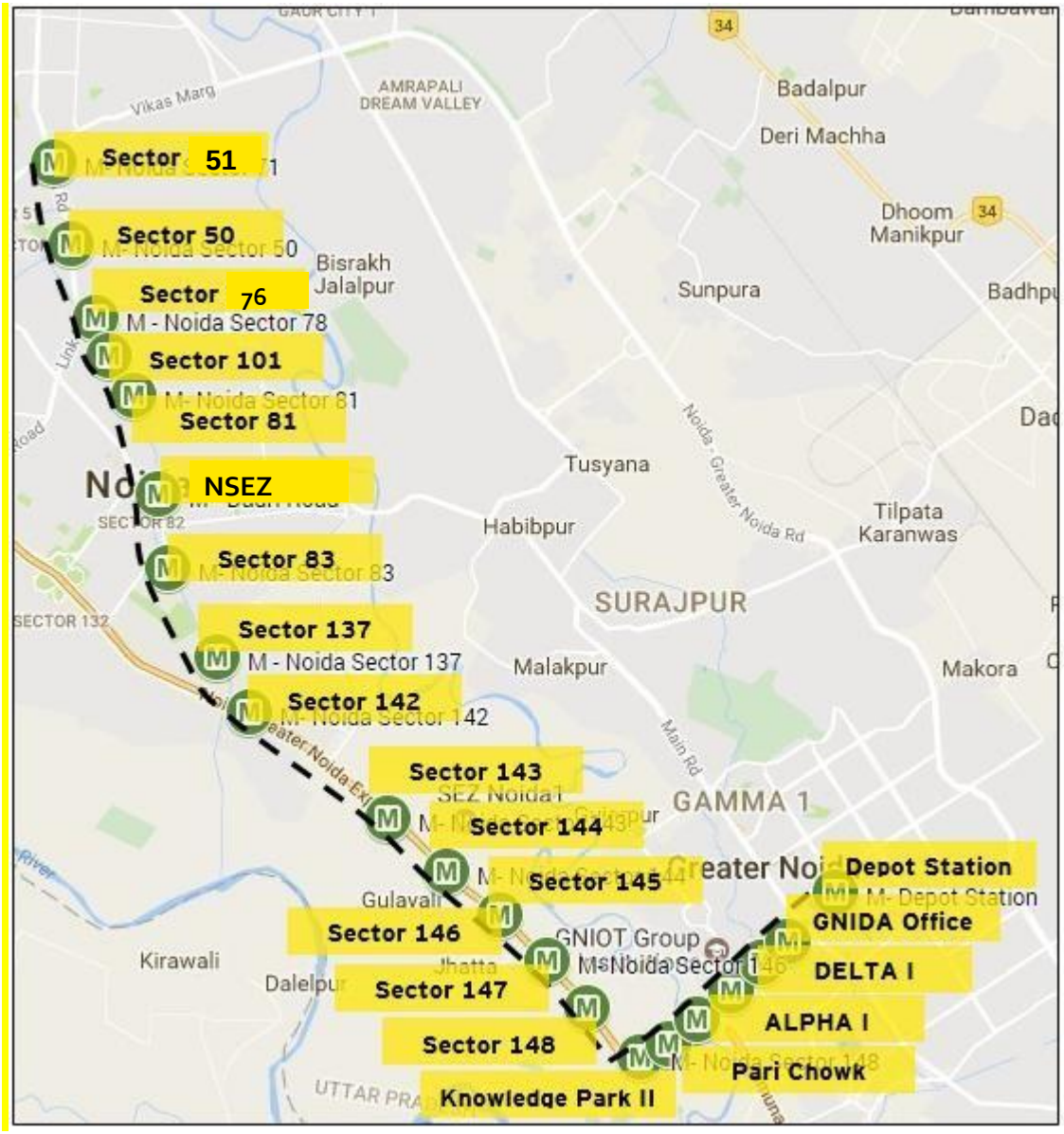

Fig: The Upcoming Metro Line

Please Note: The map shown above is indicative (not to scale)

S.NO.	Name of the Station
1.	Sector 51 Station
2.	Sector 50 Station
3.	Sector 76 Station
4.	Sector 101 Station
5.	Sector 81 Station
6.	NSEZ Station
7.	Sector 83 Station
8.	Sector 137 Station
9.	Sector 142 Station
10.	Sector 143 Station
11.	Sector 144 Station
12.	Sector 145 Station
13.	Sector 146 Station
14.	Sector 147 Station
15.	Sector 148 Station
16.	Knowledge Park II Station
17.	Pari Chowk Station
18.	ALPHA I Station
19.	DELTA I Station
20.	GNIDA Office Station
21.	Depot Station

8.2. Appendix 2: List of makes 8.2.1.

Approved makes for Civil and other works

S. No.	Details of Materials / Equipment	Manufacturer's Name
	Civil items	
1	Cement	Ultratech/ Ambuja 53 Grade
2	White Cement	Birla White
3	Wall Tiles - Vitrified	Johnson/ Nitco/ Kajaria/ Regency
4	Floor tiles – toilet and pantry	Johnson/ Nitco/ Kajaria/ Regency
5	Plumbing fixtures	Jaguar
6	UPVC Pipes	Tata/ Zenith
7	CPVC Pipes	Tata/ Zenith
8	Sanitary wares	Hindware/ Parryware/ NYCER
9	Polycorbonate Sheet	Durotuf/ Tufflite/ Duroshine
10	Puff Panel	E-Pack/ Swarn Telecome/ E-Vision
11	Water Proofing	Bitumege/ Makphalt/ Torch Shield
12	Geotextile	Wishva/ Maccaferri/ Mirafi
13	Acp	Nice Bond/ Indo Bond/ Alstone
14	Ss Grating	Belly Drain/ Mifab/ Acodrain
15	Lift	Otis/ Schindler/ Kone
	Carpentry Items	
1	Commercial plywood	Century-Sainik/ Gamet/ Samrat or equivalent
2	MDF	Duratuff/ Nuwood
3	Flush door	Green/ Galaxy
	Hardware items	
1	Aluminum section	Jindal or equivalent Geeta/ Hinda
2	Floor spring	Hyper/ Archies or equivalent
3	Door closure	Hyper/ Hardware or equivalent
4	Door stopper	Local as per item
5	Glass handles	Local as per item
6	Door Hinges – Brass	Maruti
7	Shutter Hinges	Maruti
8	Latch	Godrej/ Tag
9	Tower Bolt	Godrej

10	Cylindrical lock	Godrej
11	Door lock	Godrej/ Vijayan
12	Drawer lock	Godrej
15	Pedestal lock	Godrej
16	Screws	Laxmi/ GKW
S. No.	**Details of Materials / Equipment**	**Manufacturer's Name**
	Paint, Ceiling and Flooring	
1	Glazing	Modi/ Saint Gobain
2	Gypsum	Gypsam /Arm Strong/ Anutone
3	Paint	Asian/ Berger/ Nerolac

8.2.2. Approved makes for Plumbing works

S. No.	Details of Materials / Equipment	Manufacturer's Name
1	uPVC Pipe and fittings	Supreme, Prince, AKG
2	RCC Pipe	Pragati, Krishna Spun Pipe, OM spun pipe
3	C.I Manholes cover	Neco, Kartar, Rif
4	SFRC Manhole Cover & Grating	ABC-Accurate, Surabh

8.2.3. Approved makes for Electrical, Fire-fighting and other works

S. No.	Details of Materials / Equipment	Manufacturer's Name
A	**Medium Voltage Equipment**	
1	Power Distribution Panel	Ambit Switchgear Precision System Control Tricolite Application Control Panel Pvt. Ltd
2	Final Distribution Board	Hager-Novello Legrand Ekinox3 Siemens Beta Guard 10KA Schneider - Acti9
3	Moulded Case Circuit Breaker (MCCB)	ABB Tmax Legrand - DPX3 L&T DU sine Schneider - NSX Siemens 3VL
4	Miniature Circuit Breakers	ABB Hager-H3 Legrand - DX3 Siemens Beta Guard 10KA Schneider - Acti9

5	Residual Current Circuit Breaker (RCCB)	ABB Hager-H3 Legrand - DX3 Siemens Beta Guard 10KA Schneider - Acti9
6	Power/Aux. Contactor	ABB AF L&T- MNX Legrand CTX3 Siemens Sirius RT Schneider Tesys K, D, F

7	Control Transformer/Potential Transformers	Automatic Electric Gilbert & Maxwell Indcoil Pragati Precise Matrix
8	Current Transformer (Epoxy Cast Resin)	Automatic Electric Gilbert & Maxwell Indcoil Pragati Precise
9	Protection Relay (Numeric Type)	ABB Areva L&T Siemens
10	Indicating Lamps LED type and Push Button	GE Power Controls Larsen & Toubro (ESBEE) Schneider Electric Siemens
11	Overload relays with built in Single Phase preventer	ABB GE Power Controls Larsen & Toubro Mitsubishi Electrical Schneider Electric Siemens
12	Electronic Digital Meters (A/V/PF/Hz/KW/KWH) with LED Display	Automatic Electric L & T Schneider Electric
13	Static Power Meter & Logger (SPML)With RS 485 port	Conzerv Larsen & Toubro Schneider Electric Automatic Electric
14	PVC insulated XLPE aluminium/copper conductor armoured MV Cables upto 1100 V grade	Finolex Universal Havells Paramount

15	LT Jointing Kit / Termination	Birla-3M Raychem REPL Safe Kit
16	Cable Glands Double Compression with earthing links	Baliga Lighting Comet Cosmos
17	Bimettalic Cable Lug	Comet Cosmos Dowell's (Biller India) Hax Brass (Copper Alloy India)
18	PVC insulated copper conductor stranded flexible wires (FRLS)	Finolex Universal Havells Paramount

19	Mettalic / GI Conduit (ISI approved)	RM-Con(AKG) BEC NIC Vimco
20	PVC Conduit & Accessoires (ISI approved)	AKG BEC Polypack Precision
21	Lead Coated Flexible GI Conduit	PLICA IndiaPvt. Ltd. Flexicon ABB – Lumina/ Classic
22	Switch & Socket	Legrand - Arteor Clipsal NEO C-Metro ABB - Concept BS
23	Industrial Socket Splash Proof	Legrand Gewiss Schneider Electric
24	Industrial Socket Metal Clad	Hansel MDS Legrand
25	Ceiling Fan	Crompton Greaves Havells Bajaj Usha
26	Lighting Fixture LED	Philips India Wipro Bajaj Polycab

27	UPS	APC Schneider Emerson Network Power ABB BPE
28	Lighting & Surge Voltage Protection	ABB Hager ObeoBetterman Schneider Electric
29	230/12 V Step Down Transformer with BUILTIN Isolation Transformer	Talema Volstat
30	Energy saving Units	FMS Inncom Inn Link Systems Pumba Electronics
31	Exit Signage's	Legrand MK Prolite Philips Thorn
32	Cable tray	Ricco Slotco Indiana Engineering
33	Raceway	Legrand - CMS MK Schneider
B	**Telephone**	
a)	Cat-6 Cable	Legrand - LCS2 Panduit(Pannet) Siemon
b)	Fiber Optic Cable	Legrand - LCS2 Panduit(Pannet) Siemon
c)	Telephone Tag Blocks	KRONE Om Enterprises
2.	Telephone Armoured Cables	DELTON CABLES FINOLEX SKYTONE
3.	Patch Cords, patch panels, Splitter Box, cross connect outlet	Legrand - LCS2 Panduit(Pannet) Siemon
4.	Data Switches, Receiver, Media Converter	ALCATEL CISCO EXTREME H.P

5.	WiFi(AP's)	ALTAI COMPEX MOTOROLA RADMAX RUCKUS
6.	Racks for Data Switches	Legrand - LCS2 Rittal APW
7.	EPABX	Avaya Honeywell Alcatel Siemens

8.2.4. Approved makes for HVAC equipment

S. No.	Details of Materials / Equipment	Manufacturer's Name
1.	VRV/VRF	Daikin Toshiba Hitachi Bluestar LG
2.	Inline / Propeller Fan	Ostberg Kruger Systemair
3.	Axial Flow Fan(AMCA Certified)	Systemair Kruger Greenhack
4.	Air Handling Units (Suitable for VRV application)	Wave Zeco Edgetech Humidin
5.	Factory Made Duct(Spiral /Elliptical)	Wave Rolastar Zeco
6.	Pipe / duct supports	Gripple Easyflex Hilti
7.	Grille / Diffuser / Dampers(UL Listed)	Pineaire Systemair Ruskin Titus Mapro
8.	VRV/VRF	Daikin Toshiba Hitachi Bluestar LG

9.	Inline / Propeller Fan	Ostberg Kruger Systemair
10.	Axial Flow Fan(AMCA Certified)	Systemair Kruger Greenhack
11.	Air Handling Units (Suitable for VRV application)	Wave Zeco Edgetech Humidin
12.	Factory Made Duct(Spiral /Elliptical)	Wave Rolastar Zeco
13.	Pipe / duct supports	Gripple Easyflex Hilti
14.	Grille / Diffuser / Dampers(UL Listed)	Pineaire Systemair Ruskin Titus Mapro
	Insulation	
15.	Microban Closed Cell Elastomeric nitrile rubber (with protective coating of 7 mill black woven fiberglass as required)	Armacell(Armaflex) K-Flex
16.	Acoustic insulation Nitrile Rubber with antimicrobial property	Armacell (Arma Sound) K-Flex
17.	Starter Panel for fans & AHU	ABB L&T Honeywell
18.	Fire Sealant	Paramount Polytreat Foster Bostik

19.	Fire Wrap/Board/Paint	Paramount Polytreat 3M
20.	Copper Pipe & fittings	Rajco Mandev Tubes Mehta Tubes
21.	uPVC Drain Pipe	Astral Supreme AKG
	Miscellaneous	
22.	Vibration Isolator	Dunlop Easyflex

23.	Flexible Pipe Connection	Easyflex Pineair
24.	Flexible duct connector	Pineair Easyflex Ruskin Titus

8.3. Form 1: Letter of Proposal Submission

[Location, Date]

To

Executive Director

Noida Metro Rail Corporation (NMRC) Limited

Block-III, 3rd Floor, Ganga Shopping Complex,

Noida -201301,

District Gautam Budh Nagar, Uttar Pradesh

Subject: Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida

Dear Sir,

We, the undersigned, offer to provide the Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida in accordance with your RFP Document dated [Insert Date] and our Proposal. We are hereby submitting our Technical and Financial Proposal, in a sealed envelope. We confirm that we have read the RFP Document in totality and abide by the terms and conditions stated in the document.

We have filled the complete information correctly in **Form 15.**

We hereby declare that all the information and statements made in this Proposal are true and accept that any misinterpretation contained in it may lead to our disqualification. Our Proposal is binding upon us.

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

_____

Yours Sincerely,

Authorized Signature [In full and initials]:

Name and Title of Signatory:

Name and address of Firm:

8.4. Form 2: Firm Details

1.	**Title and name of the Project:** Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida
2.	State the structure of the Bidder's organisation (Bidders to complete/delete as appropriate)

3.	For Bidders who are individual companies or firms, state the following: Name of Company or firm: …… Legal status: (e.g. incorporated private company, proprietors …… Registered address: ……..…… Year of incorporation…….…… Principal place of business: ……. Contact person: …….. Contact person's title: …… Address, telephone, facsimile number and e-mail …… …… ……...	ip, etc.) ID of contact person:
4.	Authorized Representative …….	

8.5. Form 3: Capability Statement

It is Compulsory for the bidder to fill this statement and the bidder must upload those document that support this statement

Tender Reference No : _____

Name of Work : _____

Name of Bidder: _____

<table>
<tr><th><u>S.No.</u></th><th colspan="2"><u>ELIGIBILITY CRITERIA</u></th><th>(To be filled by the Bidder)</th></tr>
<tr><td>1</td><td>Sole proprietorship/ partnership firm/ public limited company/ private limited company</td><td>Yes/ No</td><td></td></tr>
<tr><td>2</td><td>The Bidder should have successfully completed in India should be either of the following:
i. One order of similar nature of value not less than Rs. 2.33 crore (Rupees Two crore Thirty Three Lakh only) or ii. Two orders of similar nature of value not less than Rs. 1.75 crore (Rupees One crore Seventy Five lakh only) each or
iii. Three orders of similar nature of value not less than Rs. 1.17 crore (Rupees One crore Seventeen lakh only) each</td><td>7 Years</td><td></td></tr>
<tr><td>3</td><td>The Bidder should submit the solvency certificate issued by the bankers and it should not be less than Rs. 1.17 crore (Rupees One crore Seventeen lakh only)</td><td>Yes/ No</td><td></td></tr>
<tr><th><u>S.No.</u></th><th colspan="2"><u>ELIGIBILITY CRITERIA</u></th><th>(To be filled by the Bidder)</th></tr>
<tr><td>4</td><td>The Bidder should have in the last 3 Financial Years preceding the Bid Due Date -
i. Minimum average annual turnover of Rs. 2.33 crore (Rupees Two crore Thirty Three Lakh only)</td><td><table><tr><td>FY 2017-18</td><td></td></tr><tr><td>FY 2016-17</td><td></td></tr><tr><td>FY 2015-16</td><td></td></tr><tr><td>Total</td><td></td></tr></table></td><td></td></tr>
</table>

5	The Bidder should have positive profit before tax in the last 3 (three) Financial Years preceding Bid Due Date	<table><tr><td>FY 2017-18</td><td></td></tr><tr><td>FY 2016-17</td><td></td></tr><tr><td>FY 2015-16</td><td></td></tr><tr><td>Total</td><td></td></tr></table>	
6	The Bidder requires to provide proof of employment of technical staff, which will consist of a declaration by the Bidder as per Form 10: General Guidelines for Fixing Requirement of Technical Staff for a Work.		
7	The Bidder shall submit affidavit duly verified by Notary for having arrangement of required machinery, tools & plants, centering & shuttering, etc.		
8	The Bidder shall submit the Character certificate issued by District Magistrate in the names of partners in case it is partnership firm, proprietor, in case it is proprietorship firm, directors in case it is company.		
9	The Bidder should submit the notarized affidavit that the bidder has not been blacklisted by any state/ central government/ organization in last 7 (seven) financial years.		

8.6. Form 4: Work Experience

The following format shall be used for statement of experience of Bidder:

Details of orders for the quoted item executed should be furnished in the following format.

S.No	**Name and Full address of purchaser**	**Order No. and date**	**Client (Govt./ Semi Govt./ PSU)**	**Scope**	**Total Value of work done (INR)**

Place

Date

Signature

Seal

Designation

NOTE:
Following needs to be submitted:
1. Completion Certificate /Experience certificate of past performance to be enclosed

8.7. Form 5: Financial Capability Details

Bidder should submit their financial details as per the following:

This is to certify that the Average Annual Turnover and Profitability of M/s ……

having registered office at ……

……..for last three years is as below:

S.No.	**Financial year**	**Name of the Bidder**	**Turnover (INR)**
1.			
2.			
3.			
	Average Annual Turnover		

S.No.	**Financial year**	**Name of the Bidder**	**Profitability (INR)**
1.			

2.			
3.			
	Total Profitability		

Certificate of the Chartered Accountants/Statutory Auditors

Based on Audited Accounts and other relevant documents of_____ (Name of Bidder), we M/s _____, Chartered Accountants/ Statutory Auditors, certify that the above information pertaining to FY 2015-16, 2016-17 and FY 2017-18 is correct.

Signature and Seal of
Chartered Accountants/Statutory Auditors (with membership no.)

Undertaking

I/ We _____(M/s _____) declare that the Annual Accounts have not been audited so far. We are submitting the CA certified provisional accounts, which shall be substantiated by the Audited Accounts, when prepared.

Authorised Signatory

(Name & Designation of Authorised Signatory)

In case the Financial Statements for the latest financial year are not audited and therefore the Bidder cannot make it available, the Bidder shall give an undertaking to this effect and the statutory auditor/charted accountant shall certify the same. In such a case, the Bidder shall provide the Audited Financial Statements for 2 (two) years preceding the year for which the Audited Financial Statement is not being provided. Also, pertaining to latest financial year, the bidder shall submit an affidavit certifying that "The Annual Accounts have not been audited so far. We are submitting the CA certified provisional accounts, which shall be substantiated by the Audited Accounts, when prepared."

8.8. Form 6: Memorandum

Name of Work: Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida

I/We agree to keep the quoted rate open for acceptance for 180 days from the due date of submission thereof and not make any modification in its terms and conditions.

I/We hereby declare that I/We shall treat the quotation documents, drawings and other records connected with the works as secret/ confidential documents and shall not communicate information derived there from to any person other than the information in any manner prejudicial to the safety of NMRC.

_____
Signature of the bidder with seal
Dated:

Witness:

Address:

Occupation

8.9. Form 7: Undertaking - 1

Name of Work: Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida

I confirm that M/S……..

a. Has not been banned /declared ineligible for corrupt and fraudulent practices by any government/government-undertaking/ semi-government/ govt. controlled institutions in India, any court of law having jurisdiction in India and do not have any disciplinary proceedings or pending litigations for the past 5 (five) years.

b. Does not have any pending litigation & non-performing contracts during last 5 (five) years. Further, has not been barred by any government/government-undertaking/ semi-government/ govt. controlled institutions/ private organizations in India.

c. Has not abandoned any work in last 5 (five) years.

d. Has not delayed in similar work completion during orders executed in last 5 (five) years.

e. Does not ever been terminated due to poor performance.

f. Has not suffered Bankruptcy/ insolvency in last 5 (five) years.

g. Has not been blacklisted by any organization.

h. Has not submitted any misleading information in the Bid.

i. Is financially sound to perform the work.

_____

Signature of the bidder with seal Dated:

Witness:

Address:

Occupation

8.10. Form 8: Power of Attorney

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution.)
Power of Attorney to be provided by the Bidding Company in favour of its representative as evidence of authorized signatory's authority.

Know all men by these presents, We ……(name and address of the registered office of the Bidding Company) do hereby constitute, appoint and authorize Mr./Ms……(name and residential address) who is presently employed with us and holding the position of _____, as our Attorney to do in our name and our behalf all or any of the acts, deeds or things necessary or incidental to submission of our Bid for **Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida** in response to the RFP Document dated _____ issued by Noida Metro Rail Corporation (—NMRC‖ or —the Corporation‖), including signing and submission of the Bid and all other documents related to the Bid, including but not limited to undertakings, letters, certificates, acceptances, clarifications, guarantees or any other document which the Corporation may require us to submit. The aforesaid Attorney is further authorized for making representations to the NMRC or any other authority, and providing information / responses to the NMRC, representing us in all matters before the NMRC, and generally dealing with the Corporation in all matters in connection with our Bid till the completion of the bidding process as per the terms of the RFP Document and further till the Contract is entered into with the NMRC and thereafter till the expiry of the Contract.

We hereby agree to ratify all acts, deeds and things done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall be binding on us and shall always be deemed to have been done by us.

All the terms used herein but not defined shall have the meaning ascribed to such terms under the RFP Document.

Signed by the within named
.....[Insert the name of the executant company] through
the hand of
Mr. …….
duly authorized by the Board to issue such Power of Attorney
Dated this ……. day of ……

Accepted

……
Signature of Attorney
(Name, designation and address of the Attorney)

Attested

……
(Signature of the executant)
(Name, designation and address of the executant)

……
Signature and stamp of Notary of the place of execution

Common seal of …… has been affixed in my/our presence pursuant to Board of Director's Resolution dated……
WITNESS

1. …….
   (Signature)
   Name ……

   Designation.....……..
2. …….
   (Signature)
   Name ……

   Designation.....……..

Notes:

(1) The mode of execution of the power of attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and the same should be under common seal of the executant affixed in accordance with the applicable procedure. Further, the person whose signatures are to be provided on the power of attorney shall be duly authorized by the executant(s) in this regard.

(2) In the event, power of attorney has been executed outside India, the same needs to be duly notarized by a notary public of the jurisdiction where it is executed.

(3) Also, wherever required, the executant(s) should submit for verification the extract of the charter documents and documents such as a board resolution / power of attorney, in favour of the person executing this power of attorney for delegation of power hereunder on behalf of the executant(s).

8.11. Form 9: Banker's Solvency Certificate

To

Executive Director

Noida Metro Rail Corporation (NMRC) Limited

Block-III, 3rd Floor, Ganga Shopping Complex,

Noida -201301,

District Gautam Budh Nagar, Uttar Pradesh

SOLVENCY CERTIFICATE

This is to certify that to the best of our knowledge and information M/s. …… ……. having a registered office at ……. ……, a customer of our Bank is has been dealing with us for last …… years and can be treated solvent up to a limit of INR ……. (Rupees ……..), as disclosed by the information and record which are made available to the Bank.

It is clarified that this information is furnished without any risk and responsibility on our part, or any of its officials in any respect whatsoever more particularly as a Guarantor or otherwise.

Signature & Seal of the Bank:

Date:

Note: This certificate is to be submitted on the banker‘s letterhead

Authorised Signatory
(Name & Designation of Authorised Signatory)

8.12. Form 10: General Guidelines for Fixing Requirement of Technical Staff for Work

I/We _____ S/o Shri _____ Partners/Authorized person of M/s _____ Resident of_____ Applicant for pre-qualification hereby declare that following person/persons are in my/our regular employee on the post and from the dates mentioned against them.

S. No.	Name & Address	Technical Qualification	Post held	Date of regular continuous employee

I/We undertake that if any of the post falls vacant or left unfilled for more than one month during the execution of the work entrusted to me/us by NMRC. NMRC, I/we shall inform the corporation to whom the application for pre-qualification is being made.

SEAL APPLICANT
(Notary Public)

Cost of work (Rs. In Lakh)	**Requirement of Technical staff**		**Minimum experience (Years)**	**Designation**
	Qualification	**Number**		
More than 1000	i) Project Manager with degree in corresponding discipline of Engineering. ii) Graduate Engineer iii) Graduate Engineer Or Diploma Engineer	1 1 2 2	10 5 Nil 5	Principal Technical Representative Technical represents Technical Representative
500 to 1000	i) Graduate Engineer ii) Graduate Engineer Or Diploma Engineer	1 2 2	5 Nil 5	Principal Technical Representative Technical represents
200 to 500	i) Graduate Engineer ii) Graduate Engineer Or Diploma Engineer	1 1 1	5 Nil 5	Principal Technical Representative Technical represents

50 to 200	Graduate Engineer	1	2	Principal Technical Representative
10 to 50	Graduate Engineer Or Diploma Engineer	1 1	Nil 5	Principal Technical Representative

Notes: 1. Rate of Recovery in case of non compliance of above be stipulated at following rates:-

S.No	Qualification	Experience (years)	Rate of recovery
i)	Project Manager with Degree	10	Rs. 20,000/- p.m.
ii)	Graduate Engineer	5	Rs. 15,000/- p.m.
iii)	Graduate Engineer Diploma Engineer	Nil 5	Rs. 10,000/- p.m.

8.13. Form 11: Proforma for Equipment available

(On Stamp Paper)

I/We _____ S/o Shri _____ Partners/Authorized person of M/s _____ Resident of_____
Applicant for pre-qualification hereby declare that I/we possess the following machinery, tools & plants, centering & shuttering.

S. No.	Particulars of Machinery Tools & Plant Centering & Shuttering	Estimated Cost (Rs.)	Approximate Age (Yrs)

I/We undertake that if there is any reduction in the equipment below the limit required for pre-qualification, I/we will inform Engineer in charge, NMRC to whom application for pre-qualification is being made.

SEAL APPLICANT
(Notary Public)

8.14. Form 12: Salable Form for Tender Document

Job No. ……..

The required fee of tender form has been deposited in _____ Bank A/c No. _____ RTGS/NEFT and the scanned copy of UTR receipt with Transaction Id is being enclosed with E-tender documents. If the copy of UTR receipt is not uploaded with the E-tender the tender shall be rejected.

DETAILS OF ERNEST MONEY ATTACHED

The required amount of Earnest money has been deposited in _____ Bank A/c No. _____ RTGS/NEFT and the scanned copy of UTR receipt with transaction Id is being enclosed with E-tender documents. If the copy of UTR receipt is not uploaded with the E-tender the tender shall be rejected.

BIDDER

8.15. Form 13: Declaration of Refund of Earnest Money

Noida Metro Rail Corporation (NMRC) Limited
Block-III, 3rd Floor,
Ganga Shopping Complex, Sector-29, Noida -201301,
District Gautam Budh Nagar, Uttar Pradesh, India

1	**Bidder Name**	
2	**Bidder Address**	
3	**Bank Name**	
4	**Bank Branch**	
5	**A/c No**	
6	**IFSC Code**	
7	**PAN No.**	
8	**Tin/TAN No.**	
9	**GST No.**	

10 Phone No.

11 Mobile No.

12 Email-Id

For Office Use Only 13 **Party Unique Id**

The above provided information is true to the best of my knowledge.

Date: **Signature with Stamp/Seal**

8.16. Form 14: Bid Offer/ BOQ (Format)

To

Executive Director

Noida Metro Rail Corporation (NMRC) Limited

Block-III, 3rd Floor, Ganga Shopping Complex

Noida -201301,

District Gautam Budh Nagar, Uttar Pradesh

THIS FORM IS NOT TO BE FILLED. THE BIDDERS ARE REQUIRED TO FILL THE FINANCIAL PROPOSAL IN XLS FORMAT AFTER DOWNLOADING THE FORM FROM THE E-PROCUREMENT WEBSITE FOR THIS TENDER DOCUMENT

Sub: Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida

Dear Sir,

I/we have read and examined the RFP document, general terms and conditions.

I/we hereby quote for the Total Price for **Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida** as specified below, payable by NMRC.

Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex,

Price Schedule
(It is to be noted that BOQ corresponds to Section-6 Technical Specifications of Tender Document)

S.No	Description of Items	Unit	Qty.	Rate (Rs)	Amount (Rs)
	Civil Work				
	Earth Work-				
1	Earthwork in excavation by mechanical means (Hydraulic excavator)/ manual means in foundation trenches or drains (not exeeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottoms,lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 mtr.- ALL KINDS OF SOIL	Cum	410.598	166.40	68323.54
2	Excavating trenches of required width for pipes cables, etc, including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5 m including getting out the excavated soil , and then returning the soil as required , in layers not exceeding 20 cm in depth including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed , within a lead of 50 m				
	All kinds of soil				
	Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm.	Metre	77.245	352.00	27190.24
3	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.	Cum	410.598	125.75	51632.72
4	Supplying and filling in plinth with sand under floors, including watering, ramming, consolidating and dressing complete.	Cum	117.871	917.75	108175.83
5	Supplying chemical emulsion in sealed containers including delivery as specified.				
	Chlorpyriphos/ Lindane emulsifiable concentrate of 20%	Litre	137.00	185.95	25475.15

6	Diluting and injecting chemical emulsion for Pri & POST-CONSTRUCTIONAL anti- termite treatment (excluding the cost of chemical emulsion) :				

S.No	Description of Items	Unit	Qty.	Rate (Rs)	Amount (Rs)
	Along external wall where the apron is not provided using chemical emulsion @ 7.5 litres / sqm of the vertical surface of the substructure to a depth of 300 mm including excavation channel along the wall & rodding etc. complete:				
	With Chlorpyriphos/ Lindane E.C. 20% with 1% concentration.	Metre	137.030	16.80	2302.10
7	Supplying and filling good earth brought from outside in planters terrace garden 3rd Floor complete.GROWING MEDIUM SOIL	Cum	19.221	332.55	6392.04
8	Cartage of Good earth up to 5 kilometres	Cum	19.221	149.17	2867.20
9	Cartage of Good earth up to 5 to 10 kilometres	Cum	19.221	10.85	208.55
	Concrete Work				
10	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level :				
	1:4:8 (1 Cement : 4 coarse sand (zone-III) : 8 graded stone aggregate 40 mm nominal size)	Cum	149.724	4478.15	670485.6204
11	Providing and laying damp-proof course 50mm thick with cement concrete 1:2:4 (1 cement : 2 coarse sand(zone-III) : 4 graded stone aggregate 20mm nominal size).	Sqm	40.862	320.25	13085.99
12	Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification.	Per 50 Kg. Cement	14.0	47.95	671.30

13	Providing & applying a coat of residual petroleum bitumen of grade of VG-10 of approved quality using 1.7kg per square metre on damp proof course after cleaning the surface with brushes and finally with a piece of cloth lightly soaked in kerosene oil.	Sqm	40.862	91.90	3755.20

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
14	Making plinth protection 50mm thick of cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) over 75mm thick bed of dry brick ballast 40 mm nominal size, well rammed and consolidated and grouted with fine sand, including necessary excavation, levelling & dressing & finishing the top smooth.	Sqm	52.404	450.35	23600.14
	Form Work				
15	Centering and shuttering including strutting, propping etc. and removalof form for all heights				
	Foundations, footings, bases of columns, etc. for mass concrete	Sqm	186.401	193.95	36152.47
16	Columns, Pillars, Piers, Abutments, Posts and Struts	Sqm	364.524	467.85	170542.78
17	Vertical and horizontal fins individually or forming box louvers band, facias and eaves boards	Sqm	22.572	627.85	14171.83
18	Suspended floors, roofs, landings, balconies and accessplatform. with water proof ply 12 mm thick	Sqm	286.873	497.45	142705.02
19	Lintels, beams, plinth beams, girders, bressumers andcantilevers. with water proof ply 12 mm thick	Sqm	297.585	418.95	124673.04
20	Extra for additional height in centering, shuttering where ever required with adequate bracing, propping etc., including cost of de-shuttering and decentering at all levels, over a height of 3.5 m, for every additional height of 1 metre or part thereof (Plan area to be measured				
	Suspended floors, roofs, landing, beams and balconies (Plan area to be measured)	Sqm	84.663	171.50	14519.63

	Steel Reinforcement Work.				
21	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete **upto plinth level.**				
	Thermo-Mechanically Treated bars of grade Fe-500D or more.	Kg	3454	56.60	195493.59
22	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level.				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
	Thermo-Mechanically Treated bars of grade Fe-500 D or more.	Kg	13815.80	56.60	781974.38
23	Add for plaster drip course/ groove in plastered surface or moulding to R.C.C. projections.	Metre	51.040	34.15	1743.02
	Design Mix Concrete.				
24	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.—(Note :- Cement content considered in this item is @ 330 kg/cum.—Excess/ less cement used as per design mix is payable/recoverable separately).				
	All works upto plinth level	Cum	89.630	6446.45	577794.97
25	All works above plinth level upto floor V level	Cum	134.766	7250.05	977058.74
26	Extra for providing richer mixes at all floor levels.				
	Note:- Excess/less cement over the specified cement content used is payable /recoverable separately.				

	Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum)	Cum	5.000	69.50	347.50
27	Providing M-35 grade concrete instead of M-25 grade BMC/RMC. (Note : Cement content considered in M-35 is @ 350 kg/cum)	Cum	5.000	138.95	694.75
28	Add for using extra cement in the items of design mix over and above the specified cement content therein.	Qntl	10.000	672.75	6727.50
	Brick Work				
29	Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in foundation and plinth in:				
	Cement mortar 1:4 (1 cement : 6 coarse sand)	Cum	64.307	4970.30	319624.19

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
30	Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level in all shapes and sizes in :				
	Cement mortar 1:4 (1 cement : 4 coarse sand)	Cum	10.00	5,801.50	58015.00
31	Cement mortar 1:6 (1 cement : 6 coarse sand)	Cum	180.654	5,582.85	1008565.05
32	**Half brick** masonry with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level.				
	Cement mortar 1:4 (1 cement :4 coarse sand)	Sqm	5.00	684.20	3421.00
33	Extra for providing and placing in position 2 Nos 6mm dia. M.S. bars at every third course of half brick masonry.	Sqm	5.00	56.85	284.25
	Stone Work				

34	Stone work (machine cut edges) for wall lining etc. (veneer work) upto 10 metre height, backing filled with a grout of average 12 mm thick cement mortar 1:3 (1 cement : 3 coarse sand) including pointing in white cement mortar 1:2 (1 white cement : 2 stone dust) with an admixture of pigment matching the stone shade : (To be secured to the backing and the sides by means of cramps and pins which shall be paid for separately) :				
	Red sand stone - Exposed face machine cut and table rubbed with rough backing.				
	30 mm thick	Sqm	28.877	3328.95	96128.42468
35	Providing and fixing stainless steel cramps of required size and shape for anchoring stone wall lining to the backing or securing adjacent stones in stone wall lining in cement mortar 1:2 (1 cement : 2 coarse sand), including making the necessary chases in stone and holes in walls wherever required.	Kg	28.877	521.10	15047.54415
36	Wall lining butch work upto 10m height with Dholpur stone 40 mm thick rough facing on the exposed surface with stone strips of minimum length 300 mm and required width, including embedding every tenth layer and bottom most layer in masonry or concrete after making necessary chases of size 75x75 mm and by providing layer of 75 mm thick strips i/c 12 mm thick bed of cement mortar 1:3 (1 Cement : 3 coarse sand) i/c ruled pointing in cement mortar 1:2 (1 white cement : 2 stone dust) with an admixture of pigment to match the shade of stone complete as per direction of Engineer-in-charge.	Sqm	336.456	1588.20	534359.4192

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
37	Providing edge moulding to 18 mm thick marble stone counters, Vanities etc., including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge.				
	Granite work	Metre	204.827	245.70	50325.9939

38	Providing and laying Polished Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building, all complete as per the architectural drawings, with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand), laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade, including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge.				
	Polished Granite stone slab jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent. (In Flooring, Skirting and Dedo)	Sqm	333.950	2937.70	981043.74
	Wood Work				
39	Providing and fixing ISI marked flush door shutters conforming to IS : 2202 (Part I) non-decorative type, core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters:				
	35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws	Sqm	4.200	1559.75	6550.95
40	Extra for providing lipping with 2nd class teak wood battens 25 mm minimum depth on all edges of flush door shutters (over all area of door shutter to be measured).	Sqm	4.200	365.85	1536.57
41	Providing and fixing ISI marked oxidised M.S. sliding door bolts with nuts and screws etc. complete :				
	300x16 mm	Each	2	154.85	309.70
42	Providing and fixing ISI marked oxidised M.S. tower bolt black finish, (Barrel type) with necessary screws etc. complete :				
	200x10 mm	Each	2	51.05	102.10

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**

43	150x10 mm	Each	2	44.10	88.20
44	Providing and fixing ISI marked oxidised M.S. handles conforming to IS:4992 with necessary screws etc. complete :				
	125 mm	Each	2	28.60	57.20
45	Providing and fixing factory made uPVC white colour sliding glazed window upto 1.50 m in height dimension comprising of uPVC multi-chambered frame with inbuilt roller track and sash extruded profiles duly reinforced with 1.60 ± 0.2 mm thick galvanized mild steel section made from roll forming process of required length (shape & size according to uPVC profile), appropriate dimension of uPVC extruded glazing beads and uPVC extruded interlocks, EPDM gasket, wool pile, zinc alloy (white powder coated) touch locks with hook, zinc alloy body with single nylon rollers (weight bearing capacity to be 40 kg), G.I fasteners 100 x 8 mm size for fixing frame to finished wall and necessary stainless steel screws etc. Profile of frame & sash shall be mitred cut and fusion welded at all corners, including drilling of holes for fixing hardware's and drainage of water etc. After fixing frame the gap between frame and adjacent finished wall shall be filled with weather proof silicon sealent over backer rod of required size and of approved quality, all complete as per approved drawing & direction of Engineer-in-Charge. **(Single / double glass panes, wire mesh and silicon sealant shall be paid separately)**				
	Three track three panels sliding window with fly proof SS wire mesh (Two nos. glazed & one no. wire mesh panels) made of (small series) frame 92 x 44 mm & sash 32 x 60 mm both having wall thickness of 1.9 ± 0.2 mm and single glazing bead of appropriate dimension (Area of window upto 1.75 sqm).	Sqm	48.6	7494.70	364242.42
46	Providing and fixing casement handle made of zinc alloyed (white powder coated) for uPVC casement window with necessary screws etc. complete.	Each	44	149.95	6597.80
47	Providing and fixing zinc alloyed (white powder coated) touch lock for uPVC sliding window with necessary screws etc. complete.	Each	44	124.40	5473.60
48	Providing and fixing steel roller for uPVC sliding window with necessary screws etc. complete.	Each	88	72.15	6349.20
	Steel Work				

S.No	Description of Items	Unit	Qty.	Rate (Rs)	Amount (Rs)
49	Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	Kg	18090.35	67.60	1222907.80
50	Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.				
	80x1.25 mm M.S. laths with 1.25 mm thick top cover	Sqm	18.00	2316.10	41689.80
51	Providing and fixing ball bearing for rolling shutters	Each	2	379.30	758.60
52	Providing and fixing pressed steel door frames conforming to IS: 4351, manufactured from commercial mild steel sheet of 1.60 mm thickness, including hinges, jamb, lock jamb, bead and if required angle threshold of mild steel angle of section 50x25 mm, or base ties of 1.60 mm, pressed mild steel welded or rigidly fixed together by mechanical means,including M.S. pressed butt hinges 2.5 mm thick with mortar guards, lock strike-plate and shock absorbers as specified and applying a coat of approved steel primer after pre-treatment of the surface as directed by Engineer-in-charge				
	Profile B				
	Fixing with adjustable lugs with split end tail to each jamb	Metre	5.200	340.35	1769.82
53	Fixing with carbon steel galvanised dash fastener of required dia and size (to be paid for separately)	Metre	5.200	332.30	1727.96
54	Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing, staircase railing and similar works, including applying priming coat of approved steel primer.				

	M.S. tube	Kg	4215.546	92.00	387830.24

S.No	Description of Items	Unit	Qty.	Rate (Rs)	Amount (Rs)
55	Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners , stainless steel bolts etc., of required size, on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.).	Kg	599.038	472.40	282985.5512
	Flooring				
56	Kota stone slab flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab, including rubbing and polishing complete with base of cement mortar 1 : 4 (1 cement : 4 coarse sand) :				
	25 mm thick	Sqm	73.835	1158.10	85508.31
57	Kota stone slabs 20 mm thick in risers of steps, skirting, dado and pillars laid on 12 mm (average) thick cement mortar 1:3 (1 cement: 3 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete.	Sqm	7.812	1238.20	9672.82
58	Providing and laying rectified Glazed Ceramic floor tiles of size 300x300 mm or more (thickness to be specified by the manufacturer), of 1st quality conforming to IS : 15622, of approved make, in colours White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick cement mortar 1:4 (1 Cement: 4 Coarse sand), jointing with grey cement slurry @ 3.3kg/ sqm including grouting the joints with white cement and matching pigments etc., complete.	Sqm	108.936	822.45	89594.41

59	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS: 15622, of approved make, in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand), jointing with grey cement slurry @ 3.3kg/sqm including grouting the joints with white cement and matching pigments etc., complete				
	Size of Tile 600x600 mm	Sqm	427.460	1119.40	478498.16
	Roofing				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
60	Providing gola 75x75 mm in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 stone aggregate 10 mm and down gauge), including finishing with cement mortar 1:3 (1 cement : 3 fine sand) as per standard design :				
	In 75x75 mm deep chase	Metre	109.31	153.00	16724.74
61	Making khurras 45x45 cm with average minimum thickness of 5 cm cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate of 20 mm nominal size) over P.V.C. sheet 1 m x1 m x 400 micron, finished with 12 mm cement plaster 1:3 (1 cement : 3 coarse sand) and a coat of neat cement, rounding the edges and making and finishing the outlet complete.	Each	5	187.60	938.00

62	Providing and fixing false ceiling at all height including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @ 230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound , jointing tapes , finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge but excluding the cost of painting with :				
	12.5 mm thick tapered edge gypsum fire resistant board	Sqm	223.398	922.05	205984.13

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**

63	Providing and fixing tiled false ceiling of specified materials of size 595x595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanized steel sections (galvanized @ 120 grams/ sqm, both side inclusive) consisting of main "T" runner with suitably spaced joints to get required length and of size 24x38 mm made from 0.30 mm thick (minimum) sheet, spaced at 1200 mm center to center and cross "T" of size 24x25 mm made of 0.30 mm thick (minimum) sheet, 1200 mm long spaced between main "T" at 600 mm center to center to form a grid of 1200x600 mm and secondary cross "T" of length 600 mm and size 24x25 mm made of 0.30 mm thick (minimum) sheet to be interlocked at middle of the 1200x600 mm panel to form grids of 600x600 mm and wall angle of size 24x24x0.3 mm and laying false ceiling tiles of approved texture in the grid including, required cutting/making, opening for services like diffusers, grills, light fittings, fixtures, smoke detectors etc. Main "T" runners to be suspended from ceiling using GI slotted cleats of size 27 x 37 x 25 x1.6 mm fixed to ceiling with 12.5 mm dia and 50 mm long dash fasteners, 4 mm GI adjustable rods with galvanised butterfly level clips of size 85 x 30 x 0.8 mm spaced at 1200 mm center to center along main T, bottom exposed width of 24 mm of all T-sections shall be pre-painted with polyester paint, all complete for all heights as per specifications, drawings and as directed by Engineer-in-charge.				
	12.5 mm thick fully Perforated Gypsum Board tile made from plasterboard having glass fibre conforming to IS: 2095 part I, of size 595x595 mm, having perforation of 9.7x9.7 mm at 19.4 mm c/c with center borders of 48 mm and the side borders of 30 mm, backed with non woven tissue on the back side, having an NRC (Noise Reduction Coefficient) of 0.79, with 50 mm resin bonded glass wool backing.	Sqm	275.481	1005.35	276954.82
	Finishing				
64	12 mm cement plaster of mix :				
	1:6 (1 cement: 6 fine sand)	Sqm	451.811	160.35	72447.89
65	15 mm cement plaster on the rough side of single or half brick wall of mix :				
	1:6 (1 cement: 6 fine sand)	Sqm	1610.626	185.20	298287.99
66	12 mm cement plaster finished with a floating coat of neat cement of mix :				
	1:4 (1 cement: 4 fine sand)	Sqm	81.024	214.20	17355.34

S.No	Description of Items	Unit	Qty.	Rate (Rs)	Amount (Rs)
67	6 mm cement plaster of mix :				
	1:3 (1 cement : 3 fine sand)	Sqm	265.445	143.80	38171.01
68	Distempering with dry distemper of approved brand and manufacture (two or more coats) of required shade on new work, over and including water thinnable priming coat to give an even shade.	Sqm	495.191	71.85	35579.44
69	Finishing walls with textured exterior paint of required shade :				
	New work (Two or more coats applied @ 3.28 ltr/10 sqm) over and including priming coat of exterior primer applied @ 2.20kg/10 sqm	Sqm	511.541	150.65	77063.68
70	Finishing walls with water proofing cement paint of required shade :				
	New work (Two or more coats applied @ 3.84 kg/10 sqm)	Sqm	277.207	58.80	16299.77
71	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade :				
	Two or more coats on new work	Sqm	290.180	78.40	22750.11
	Dismantling and Demilishing Work.				
72	Demolishing cement concrete manually/ by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in - charge.				
	Nominal concrete 1:3:6 or richer mix (i/c equivalent design mix.	Cum	4.20	997.05	4187.61
73	Nominal concrete 1:4:8 or leaner mix (i/c equivalent design mix.	Cum	12.60	615.15	7750.89
74	Demolishing R.C.C. work manually/ by mechanical means including stacking of steel bars and disposal of unserviceable material within 50 metres lead as per direction of Engineer - in- charge.	Cum	24.340	1454.55	35403.747

75	Extra for scrapping, cleaning and straightening reinforcement from R.C.C. or R.B. work.	Kg	1488.396	3.90	5804.7444
76	Demolishing brick work manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-charge.				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
	In cement mortar	Cum	28.064	842.75	23650.66632
77	Dismantling doors, windows and clerestory windows (steel or wood) shutter including chowkhats, architrave, holdfasts etc. complete and stacking within 50 metres lead :				
	Of area 3 sq. metres and below	Each	10	158.85	1588.50
78	Dismantling steel work in built up sections in angles, tees, flats and channels including all gusset plates, bolts, nuts, cutting rivets, welding etc. including dismembering and stacking within 50 metres lead.	Kg	600	2.40	1440.00
79	Demolishing dry brick pitching in floors, drains etc. including stacking serviceable material and disposal of unserviceable material within 50 metres lead :	Cum	65.859	539.80	35550.69
	Aluminium Work.				
80	Providing and fixing double action hydraulic floor spring of approved brand and manufacture conforming to IS : 6315, having brand logo embossed on the body / plate with double spring mechanism and door weight upto 125 kg., for doors, including cost of cutting floors , embedding in floors as required and making good the same matching to the existing floor finishing and cover plates with brass pivot and single piece M.S. sheet outer box with slide plate etc. complete as per the direction of Engineer-in-charge.				
	With stainless steel cover plate minimum 1.25 mm thickness.	Each	8	2054.40	16435.20
81	Providing and fixing aluminium tubular handle bar 32 mm outer dia, 3.0 mm thick & 2100 mm long with SS screws etc .complete as per direction of Engineer-inCharge.				

	Powder coated minimum thickness 50 micron aluminium tubular handle bar.	Each	8	509.30	4074.40
82	Providing and fixing 12 mm thick frameless toughened glass door shutter of approved brand and manufacture, including providing and fixing top & bottom pivot & spring type fixing arrangement and making necessary holes etc. for fixing required door fittings, all complete as per direction of Engineer-in-charge (Door handle, lock and stopper etc.to be paid separately).	Sqm	71.143	4608.85	327887.42
83	Providing and laying integral cement based water proofing treatment including preparation of surface as required for treatment of roofs, balconies, terraces etc consisting of following operations:				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
	(a) Applying a slurry coat of neat cement using 2.75 kg/sqm of cement admixed with water proofing compound conforming to IS. 2645 and approved by Engineerin-charge over the RCC slab including adjoining walls up to 300 mm height including cleaning the surface before treatment.				
	(b) Laying brick bats with mortar using broken bricks/brick bats 25 mm to 115 mm size with 50% of cement mortar 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-incharge over 20 mm thick layer of cement mortar of mix 1:5 (1 cement :5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls up to 300 mm height including rounding of junctions of walls and slabs.				
	(c) After two days of proper curing applying a second coat of cement slurry using 2.75 kg/ sqm of cement admixed with water proofing compound conforming to IS : 2645 and approved by Engineer in-charge.				
	(d) Finishing the surface with 20 mm thick jointless cement mortar of mix 1:4 (1 cement :4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer in-charge including laying glass fibre cloth of approved quality in top layer of plaster and finally finishing the surface with trowel with neat cement slurry and making pattern of 300x300 mm square 3 mm deep.				
	(e) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer-in-Charge :				

	With average thickness of 120 mm and minimum thickness at khurra as 65 mm.	Sqm	153.463	1034.65	158780.30
	Structural Glazing and Composit Panel				
84	Providing and supplying aluminium extruded tubular and other aluminium sections as per the architectural drawings and approved shop drawings , the aluminium quality as per grade 6063 T5 or T6 as per BS 1474,including super durable powder coating of 60-80 microns conforming to AAMA 2604 of required colour and shade as approved by the Engineer-in-Charge. (The item includes cost of material such as cleats, sleeves, screws etc. necessary for fabrication of extruded aluminium frame work. Nothing extra shall be paid on this account).	Kg	983.940	338.25	332817.8603
85	Designing, fabricating, testing, protection, installing and fixing in position semi (grid) unitized system of **structural glazing** (with open joints) for linear as well as curvilinear portions of the building for all heights and all levels, including:				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
	(a) Structural analysis & design and preparation of shop drawings for the specified design loads conforming to IS 875 part III (the system must passed the proof test at 1.5 times design wind pressure without any failure), including functional design of the aluminum sections for fixing glazing panels of various thicknesses, aluminium cleats, sleeves and splice plates etc. gaskets, screws, toggles, nuts, bolts, clamps etc., structural and weather silicone sealants, flashings, fire stop (barrier)- cum-smoke seals, microwave cured EPDM gaskets for water tightness, pressure equalisation & drainage and protection against fire hazard including:				
	(b) Fabricating and supplying serrated M.S. hot dip galvanised / Aluminium alloy of 6005 T5 brackets of required sizes, sections and profiles etc. to accommodate 3 Dimentional movement for achieving perfect verticality and fixing structural glazing system rigidly to the RCC/ masonry/structural steel framework of building structure using stainless steel anchor fasteners/ bolts, nylon seperator to prevent bimetallic contacts with nuts and washers etc. of stainless steel grade 316, of the required capacity and in required numbers.				

	(c) Providing and filling, two part pump filled, structural silicone sealant and one part weather silicone sealant compatible with the structural silicone sealant of required bite size in a clean and controlled factory / work shop environment , including double sided spacer tape, setting blocks and backer rod, all of approved grade, brand and manufacture, as per the approved sealant design, within and all around the perimeter for holding glass.				
	(d) Providing and fixing in position flashings of solid aluminium sheet 1 mm thick and of sizes, shapes and profiles, as required as per the site conditions, to seal the gap between the building structure and all its interfaces with curtain glazing to make it watertight.				

S.No	Description of Items	Unit	Qty.	Rate (Rs)	Amount (Rs)
	(e) Making provision for drainage of moisture/ water that enters the curtain glazing system to make it watertight, by incorporating principles of pressure equalization, providing suitable gutter profiles at bottom (if required), making necessary holes of required sizes and of required numbers etc. complete. This item includes cost of all inputs of designing, labour for fabricating and installation of aluminium grid, installation of glazed units, T&P, scaffolding and other incidental charges including wastages etc., enabling temporary structures and services, cranes or cradles etc. as described above and as specified. The item includes the cost of getting all the structural and functional design including shop drawings checked by a structural designer, dully approved by Engineer-in-charge. The item also includes the cost of all mock ups at site, cost of all samples of the individual components for testing in an approved laboratory, field tests on the assembled working structural glazing as specified, cleaning and protection till the handing over of the building for occupation. In the end, the Contractor shall provide a water tight structural glazing having all the performance characteristics etc. all complete as required, as per the Architectural drawings, as per item description, as specified, as per the approved shop drawings and as directed by the Engineer-in-Charge.				
	Note:- 1. The cost of providing extruded aluminium frames, shadow boxes, extruded aluminium section capping for fixing in the grooves of the curtain glazing and vermin proof stainless steel wire mesh shall be paid for separately under relevant items under this sub- head. However, for the purpose of payment, only the actual area of structural glazing (including width of grooves) on the external face shall be measured in sqm. up to two decimal places.				

	Note:- 2. The following performance test are to be conducted on structural glazing system if area of structural glazing exceeds 2500 Sqm from the certified laboratories accreditated by NABL(National Accreditation Board for Testing and Calibration Laboratories), Department of Science & Technologies, India. Cost of testing is payable separately. The NIT approving authority will decide the necessity of testing on the basis of cost of the work, cost of the test and importance of the work. Performance Testing of Structural glazing system Tests to be conducted in the NBL Certified laboratories				
	(1) Performance Laboratory Test for Air Leakage Test (-50pa to - 300pa) & (+50pa to +300pa) as per ASTM E-283-04 testing method for a range of testing limit 1 to 200 mVhr				
	(2) Static Water Penetration Test. (50pa to 1500pa) as per ASTME- 331-09 testing method for a range up to 2000 ml.				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
	(3) Dynamic Water Penetration (50pa to 1500pa) as per AAMA 501.01- 05 testing method for a range upto 2000 ml				
	(4) Structural Performance Deflection and deformation by static air pressure test (1.5 times desing wind pressure without any failure) as per ASTME-330-10 testing method for a range upto 50 mm				
	(5) Seismic Movement Test (upto 30 mm) as per AAMA 501.4-09 testing method for Qualitative test. Tests to be conducted on site.				
	(6) Onsite Test for Water Leakage for a pressure range 50 kpa to 240 kpa (35psi) upto 2000 ml	Sqm	241.221	2409.90	581318.49

86	Providing, assembling and supplying vision glass panels (IGUs) comprising of hermetically-sealed 6-12- 6 mm insulated glass (double glazed) vision panel units of size and shape as required and specified, comprising of an outer heat strengthened float glass 6mm thick, of approved colour and shade with reflective soft coating on surface # 2 of approved colour and shade, an inner Heat strengthned clear float glass 6mm thick, spacer tube 12mm wide, dessicants, including primary seal and secondary seal (structural silicone sealant) etc. all complete for the required performances, as per the Architectural drawings, as per the approved shop drawings, as specified and as directed by the Engineer-inCharge. The IGUs shall be assembled in the factory/ workshop of the glass processor.—(Payment for fixing of IGU Panels in the curtain glazing is included in cost of item No.26.2)—For payment, only the actual area of glass on face # 1 of the glass panels (excluding the areas of the grooves and weather silicone sealant) provided and fixed in position, shall be measured in sqm.—				
	(i) Coloured tinted float glass 6mm thick substrate with reflective soft coating on face # 2, + 12mm Airgap + 6mm Heat Strengthened clear Glass of approved make having properties as visible Light transmittance (VLT) of 25 to 35 %, Light reflection internal 10 to 15%, light reflection external 10 to 20 %, shading coefficient (0.25- 0.28) and U value of 3.0 to 3.3 W/m2 degree K etc. The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement.	Sqm	241.221	3730.70	899923.18

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
87	Extra for openable side / top hung vision glass panels (IGUs) including providing and supplying at site all accessories and hardwares for the openable panels as specified and of the approved make such as heavy duty stainless steel friction hinges, min 4 -point cremone locking sets with stainless steel plates, handles, buffers etc. including necessary stainless steel screws/ fasteners, nuts, bolts, washers etc. all complete as per the Architectural drawings, as per the approved shop drawings, as specified and as directed by the Engineer- in-Charge.	Sqm	25.65	2941.60	75453.68
88	Designing, fabricating, testing, installing and fixing in position Curtain Wall with Aluminium Composite Panel Cladding, with open grooves for linear as well as curvilinear portions of the building , for all heights and all levels etc. including:				

	(a) Structural analysis & design and preparation of shop drawings for pressure equalisation or rain screen principle as required, proper drainage of water to make it watertight including checking of all the structural and functional design.				
	(b) Providing, fabricating and supplying and fixing panels of aluminium composite panel cladding in pan shape in metalic colour of approved shades made out of 4mm thick aluminium composite panel material consisting of 3mm thick FR grade mineral core sandwiched between two Aluminium sheets (each 0.5mm thick). The aluminium composite panel cladding sheet shall be coil coated, with Kynar 500 based PVDF / Lumiflon based fluoropolymer resin coating of approved colour and shade on face # 1 and polymer (Service) coating on face # 2 as specified using stainless steel screws, nuts, bolts, washers, cleats, weather silicone sealant, backer rods etc.				

S.No	Description of Items	Unit	Qty.	Rate (Rs)	Amount (Rs)
	(c) The fastening brackets of Aluminium alloy 6005 T5 / MS with Hot Dip Galvanised with serrations and serrated washers to arrest the wind load movement, fasteners, SS 316 Pins and anchor bolts of approved make in SS 316, Nylon separators to prevent bi-metallic contacts all complete required to perform as per specification and drawing The item includes cost of all material & labour component, the cost of all mock ups at site, cost of all samples of the individual components for testing in an approved laboratory, field tests on the assembled working curtain wall with aluminium composite panel cladding, cleaning and protection of the curtain wall with aluminium composite panel cladding till the handing over of the building for occupation. Base frame work for ACP cladding is payable under the relevant aluminium item.s The Contractor shall provide curtain wall with aluminium composite panel cladding, having all the performance characteristics all complete , as per the Architectural drawings, as per item description, as specified, as per the approved shop drawings and as directed by the Engineer-in-Charge. However, for the purpose of payment, only the actual area on the external face of the curtain wall with Aluminum Composite Panel Cladding (including width of groove) shall be measured in sqm. up to two decimal places."	Sqm	357.36	3405.90	1217123.74
	Extra Items				
89	Supply and instalation of 60 mm PUF insulated roof panel including Flashing, Hardware, Freight and instalation complete. (PUF PANEL) Make- E-PACK POLYMERS	Sqm	525.578	2265.10	1190485.60

90	Providing applying **Bitumag 4mm** thick BM TORCH G Membranes **APP** (Atactic polypropylene) modified torch on bitumen membranes which are reinforced with 160 GSM non-voven polyester mat, having softening point >150 deg. C and no crack at zero deg. C and puncture resistance > 440N meeting ASTM E154 having bottom surface thermo-fusible polyethylene film and top surface slate/granule finish to have UN protection. Make- **Bitumag, Starflex, Pedilite.**	Sqm	2500.00	479.00	1197500.00
91	Supplying and instalation 4 mm thick compect Clear **polycarbonate** sheet including 50 mm aluminium extrution, EPDM rubber gaskate sds screws & fastners, silicone transparent 789 labour, cartage etc complete. **Durotuff brand**	Sqm	21.096	3114.12	65695.48

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
92	Providing and laying 50 mm **rough finish delhi stone** of approved size, design & shape laid required colour and pattern including laying of stone in 1:3 cement mortar and including pointing with cement along with adding ... parking area **NMRC Approved Item.**				
	Rough Finish Delhi Stone	Sqm	1012.065	3240.00	3279091.6
93	Providing and Fixing ERP channel of 100x50 mm with **SS Grating** of load class A15 human load.**Bely Drain**	Metre	76.38	20402.84	1558368.919
	P/F side outlet to ERP channel	Each	8	3701.34	29610.72
94	Providing and laying non **woven Geotextile** of quality code ST-14 and GSM 140 (+-5%) 0.8 to 0.9 mm thick over **Drainage Board** of quality code DB-04 and GSM 400 (+-5%) and 8 to 9 mm thick for terrace gardening under soil.	Sqm	121.536	793.00	96378.05
95	Supplying of 6 mm thick toughened glass in cut sizes as required for uPVC window Brand-Saint Gobain	Sqm	39.99	929.00	37154.19

	Plumbing Work:-				
	Rain Water Pipes & Fittings				
96	Providing and fixing on wall face unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion				
	(i) Single socketed pipes.				
	75 mm diameter	Metre	10	148.75	1487.50
97	110 mm diameter	Metre	65	236.35	15362.75
98	Providing and fixing on wall face unplasticised - PVC moulded fittings/accessories for unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion.				
	Coupler				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
	75 mm	Each	4	64.95	259.80
99	110 mm	Each	8	102.65	821.20
100	Single tee without door				
	75x75x75 mm	Each	2	105.25	210.50
101	110x110x110 mm	Each	4	167.60	670.40
102	Providing and fixing on wall face unplasticised - PVC moulded fittings/accessories for unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion.				
	Bend 87.5°				

	75 mm bend	Each	2	76.55	153.10
103	110 mm bend	Each	8	113.10	904.80
	Water Supply				
104	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge.				
	Concealed work, including cutting chases and making good the				
	20 mm nominal outer dia Pipes	Metre	20.00	284.85	5697.00
105	25 mm nominal outer dia Pipes	Metre	55.00	333.60	18348.00
106	32 mm nominal outer dia Pipes	Metre	35.00	412.90	14451.50
107	Providing and fixing brass bib cock of approved quality :				
	15 mm nominal bore	Each	2	260.10	520.20
108	20 mm nominal bore	Each	2	280.40	560.80

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
109	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :				
	32 mm nominal bore.	Each	4	501	2003.00
	External Sewerage & Storm Water Drainage				

110	Excavating trenches of required width for pipes, cables etc. including excavation for sockets and dressing of sides, ramming of bottom depth upto 1.5m including getting out the excavated soil and then returning the soil as required in layers not exceeding 20 cms in depth including consolidating each deposited layer by ramming, watering etc.and disposing of surplus excavated soil outside the site premises.				
	All kind of soil				
	Pipes exceeding 80mm dia but not exceeding 300mm dia.	Metre	200	225.45	45090.00
111	Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) upto haunches of rcc pipes including bed concrete as per standard design:				
	150 mm dia.	Metre	170	479.85	81574.50
112	250 mm dia.	Metre	10	656.60	6566.00
113	Providing and laying non-pressure NP2 class (light duty) R.C.C pipes jointed withh stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete				
	150 mm dia. R.C.C. pipe	Metre	170	356.7	60639.00
114	250 mm dia. R.C.C. pipe	Metre	10	482.05	4820.50
115	Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand) withh R.C.C. top slab withh 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick withh cement mortar 1:3 (1 cement : 3 coarse sand) finished withh floating coat of neat cement and making channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4graded stone aggregate 20 mm nominal size) finished withh a floating coat of neat cement complete as per standard design :				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
	Inside size 90x80 cm and 45 cm deep including C.I. cover withh frame (Extra Heavy duty duty) 560mm internal diameter.				

	Withh common burnt clay F.P.S. (non-modular) bricks of class designation 7.5	Each	4	8635.10	34540.40
116	Extra for depth for manholes- size 90x80 cm with common burnt clay F.P.S.(non modular) brick of class designation 7.5 (exceeding 450 mm but not exceeding 900 m Depth)				
	Size 90 X 80 Cm				
	With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	Metre	1	5718.60	5718.60
117	Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS:10910 on 12 mm dia steel bar conforming to IS 1786 having minimum cross section as 23 mm x 25 mm and overall minimum length 263 mm and width as 165 mm with space between protruded legs having 2 mm tread on top surface by ribbing on chequering besides necessary and adequate anchoring projections on tall length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufacturer's permanent identification mark to be visible even after fixing, including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1 cement:3 coarse sand: 6 graded stone aggregate 20 mm nominal size) complete as per design.	Each	40	327.90	13116.00
118	Constructing brick masonry road gully chamber 50x45x60 cm with bricks in cement mortar 1:4 (1 cement : 4 coarse sand) including 500x450 mm pre-cast R.C.C. horizontal grating with frame complete as per standard design :				
	With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	Each	5	4043.10	20215.50
	Fire Fighting Work				
	Fire Extinguisher				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**

119	Providing and fixing fire extinguisher of carbon dioxide type consisting of brand newhigh pressure steel cylinder bearing IS: 7285 mark and having the approval ofcontroller of explosives Nagpur, wheel type valve bearing IS:3224 markinternal discharge tube, 1 meter long high pressure discharge hose, nonconducting horn, suspension bracket, fully charged bearing IS: making fixedto wall as directed conforming IS : 15683 1.1 4.5kgcapacity cylinder	Each	6	12182	73092
120	Providingand fixing ISI marked portable fire extinguishers of the following type.	Each	6	6497	38982
	Horticulture Work				
121	Preparation of beds for hedging and shrubbery by excavating 60 cm deep and trenching the excavated base to a further depth of 30 cm, refilling the excavated earth after breaking clods and mixing with sludge or manure in the ratio of 8:1 (8 parts of stacked volume of earth after reduction by 20% : one part of stacked volume of sludge or manure after reduction by 8%), flooding with water, filling with earth if necessary, watering and finally fine dressing, leveling etc. including stacking and disposal of materials declared unserviceable and surplus earth by spreading and leveling as directed, within a lead of 50 m, lift up to 1.5 m complete (cost of sludge, manure or extra earth to be paid for separately)	cum	67.7	130.35	8824.70
122	Foliage				
	Providing and displaying of Aglaonema dove variety Plant, having ht. 30 cm to 45 cm with 8 to 10 leaves, well developed, fresh and healthy in 25 cm size of Earthen pot / Plastic pot & as per direction of the officer-in-charge.	Each	40	82.00	3280.00
123	Providing and displaying of Chamaedorea elegans palm plant, having ht. 60 cm to 75 cm, well developed with fresh and healthy leaves in 25 cm size of Earthen pot / Plastic pot . & as per direction of the officer-in-charge.	Each	60	102.50	6150.00
124	Providing and displaying of Monestaria plant mounted on moss stick 90 cm ht., 2 to 3 plant in one pot well developed with fresh & healthy foliage in 25 cm size of Earthen pot / Plastic pot & as per direction of the officer-incharge.	Each	85	205.00	17425.00
125	Providing and displaying of Philodendron Burgundy plant mounted on moss stick 90 cm ht., well developed with full of fresh & healthy leaves from bottom to top in 25 cm size of Earthen pot / Plastic pot & as per direction of the officer-in-charge.	Each	70	246.00	17220.00

S.No	Description of Items	Unit	Qty.	Rate (Rs)	Amount (Rs)
126	Providing and displaying of Raphis palm plant, having ht. 75 cm to 90 cm with 12 to 15 equal suckers, well developed, full of fresh & healthy leaves from bottom to top in 25 cm size Earthen pot / Plastic pot & as per direction of the officer-incharge.	Each	60	461.25	27675.00
127	Shrubs				
	Supply and stacking of plant Beloperone species of height 30-45 cm. in poly bags of size 20 cm as per direction of the officer-in-charge.	Each	100	40.00	4000.00
128	Providing and Laying Golden Dhuranta Plant upto 300 mm high well developed, full of fresh and Healthy Leaves.	Each	150	39.44	5916.00
129	Providing and Laying MINI CHANDNI Plant upto 300 mm high well developed, full of fresh and Healthy Leaves.	Each	80	113.53	9082.40
130	Providing and Laying SADABAHAR Plant upto 300 mm high well developed, full of fresh and Healthy Leaves.	Each	200	51.33	10266.00
131	Providing and Laying UFORBIA MILI Plant upto 300 mm high well developed, full of fresh and Healthy Leaves.	Each	200	100.05	20010.00
	Electrical Work				
	Sub Head-1: Wiring & Submain				
132	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.				
	Group C	Each	80	757.00	60,560.00

133	Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without independent switch etc.) with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed PVC conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc. as required.				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
	Group C	Each	106	415.00	43,990.00
	Wiring for 6A Sockets and 16A sockets				
134	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 5/6 A modular socket outlet and 5/6 A modular switch, connections etc. as required.	Each	8	313.00	2,504.00
135	Supplying and fixing **modular blanking plate** on the existing modular plate & switch box excluding modular plate as required.	Each	10	24	240.00
136	Erection **and testing of ceiling fan** and regulator etc excluding supply of down rod, complete in all respect.	Each	2	68	136.00
137	Supply and fixing of power plug with 15A/250 volt flush type switch and 5 pin 15A/250V flush type universal socket in suitable M.S. box of 175mm x 100mm x 50mm size with phenolic laminated bakelite sheet cover 3mm thick fixed with brass machine screw and cup washer.	Each	12	270	3,240.00
138	S/F of **hexagonal fan box** with hexagonal side of approx. 80 mm.in length fabricated from 16 SWG M.S. sheet incorporating with 10 mm. dia. M.S. round bar duly bent for supporting fan hanger duly painted with red oxide and screwing arrangement with wiring conduit laid in the R.C.C. roof before concreting along with supply of all materials, labour, T&P etc. for proper completion of work.	Each	2	135	270.00

139	Supply & fixing of electronic **Fan regulator**, dimmer, 120-280 V ISI marked, on the existing switch board including making connections, required material, labour T/P etc. for proper completion of work to the satisfaction of Engineer of work.	Each	2	305	610.00
140	Supply & wiring of **sub main** with two number 6 sq. mm. FR P.V.C. insulated 1100 volts grade single core **copper conductor** cable in 25 mm dia heavy duty(2 mm thick) PVC conduit with one number 4 sq. mm. FR PVC insulated multistranded copper cable as earth continuity wire drawn in conduit partly concealed in wall and patly laid in slab along with reinforcement before concreating.	Metre	300	206	61,800.00

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
141	Supply & wiring of **sub main** with FR P.V.C. insulated 1100 volts grade single core **copper conductor** cable in 32 mm dia heavy duty(2 mm thick) PVC conduit with FR PVC insulated multistranded copper cable as earth continuity wire drawn in conduit partly concealed in wall and patly laid in slab along with reinforcement before concreating.				
	4 x 6 sq. mm.+ 2x4 sq. mm. in 32 mm dia conduit.	Metre	20	428.00	8,560.00
	4 x10 sq. mm.+ 2x6 sq. mm. in 32 mm dia conduit.	Metre	20	570.00	11,400.00
142	Supply & wiring of 4 numbers 16 sq. mm. PVC insulated 1100V grade single core copper conductor cable in 40 mm dia PVC conduit partly concealed in wall and partly laid in slab along with reinforcement before concreating, with two number 10 sq mm single core copper conductor cable as earth continuity wire drawn in conduit including matching colour wash etcm complete in all respect.	Metre	20	939.00	18,780.00

143	Supply fixing and concealing **rigid steel conduit pipe** in the wall including cutting of brick work, laying of conduit and fixing it with M.S. hooks and then plastering with cement, sand motar finished to the level, with matching color wash including cost of proper threading of the conduit and providing necessary sockets, bends and chuck nuts as directed by the engineer-in-charge with supply of all material labour and T&P required for proper completion of work. (for Telephone / Television / circuits)				
	20 mm dia. conduit (16 SWG) thick	Metre	20	107.00	2,140.00
	25 mm dia. conduit (16 SWG) thick	Metre	100	125.00	12,500.00
	32 mm dia. conduit (16 SWG) thick	Metre	10	175.00	1,750.00
	Sub Head -II : Distribution Board				
144	Supply and fixing of 16Amp. 240V SPN metal clad rewireable type switch fuse unit on M.D.F.E.G./Teak wood board complete in all respect.	Each	1	555.00	555.00

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
145	Supply and fixing of 32Amp. 415V TP metal clad rewireable type switch fuse unit on angle iron bracket complete in all respect.	Each	1	3753.00	3,753.00
146	Supply and fixing surface/flush mounting SPN distribution board(Legrand Lexic) without MCB with additional metal door complete in all respect, as directed at site by Engineer in charge. (CAT A)				
	8 way SPN	Each	5	1760.00	8,800.00
	12 way SPN	Each	2	2100.00	4,200.00

147	Supply and fixing surface/flush mounting TPN distribution board(Legrand Lexic) without MCB with additional metal door complete in all respect, as directed at site by Engineer in charge.				
	6 way TPN	Each	1	9200.00	9,200.00
	8 way TPN	Each	1	10900.00	10,900.00
	12 way TPN	Each	1	15000.00	15,000.00
148	S & F of 6Amp. To 32 Amp. SPMCB(10KA)(Legrand Lexic)	Each	64	250.00	16,000.00
149	Supplying and fixing single pole blanking plate in the existing MCB DB complete etc. as required.	Each	10	7.00	70.00
150	Supplying and fixing 40Amp. D.P. isolator)(Legrand Lexic)	Each	7	450.00	3,150.00
151	Supplying and fixing 40Amp. T.P. isolator)(Legrand Lexic)	Each	1	765.00	765.00

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
152	Supplying and fixing 63Amp. T.P. isolator)(Legrand Lexic)	Each	2	880.00	1,760.00
153	Supplying, fixing & making connection of 25A 2 pole 30mA ELCB/RCCB of din rail mounting complete in all respect as per direction and satisfaction to the engineer in charge.	Each	1	2150.00	2,150.00

154	Supplying, fixing & making connection of 40A 2 pole 30mA ELCB/RCCB of din rail mounting complete in all respect as per direction and satisfaction to the engineer in charge.	Each	7	2245.00	15,715.00
155	Supplying, fixing & making connection of 63A 2 pole 30mA ELCB/RCCB of din rail mounting complete in all respect as per direction and satisfaction to the engineer in charge.	Each	16	2830.00	45,280.00
156	S/F of **shock treatment chart** (prescribed under I.E.rules) duly framed with glass and supported from back with hard board or soft board with supply of all material labour T & P etc for proper completion of work.	Each	4	235.00	940.00
157	Supply and laying of 1800 mm x 900 mm x 12 mm thick **chequered rubber matting** of tested quality.	Each	1	2525.00	2,525.00
158	S/F of **danger board** fabricated from 10 gauge M.S. sheet as per E/I rules.	Each	4	70.00	280.00
	Sub-Head -III- Sub Distribution Boards				
	Design, manufacture, supplying fixing in position of the following front operated cubicle type,compartmentalised with front access, dead back, 2mm thick steel enclosed free standing, dust and vermin proof, switchboard with IP42 protection with hinged and lockable doors complete with interconnections, tinned copper crimping lugs, bonding to earth and painting, suitable for use at 415 volts, 3 phase 4 wire 50 Hertz system, and suitable for a fault level of 25 KA symmetrical at 415 volts.				
	All switchboards shall be modular type and have provision for entry of cables from the top /bottom as required.				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
	The cost shall include providing and fixing of 100 x 50 x 6 mm channels for switchboard support.				

	All live accessible parts shall be shrouded and all equipment shall be finger touch proof. The Busbars insulation shall be with heat shrinkable sleeves. SMC/DMC shrouds and busbar supports shall be used.				
	All MCCB shall have phase barriers, rotary handles and extension terminal as required .				
	All unbalanced kWH meter shall have communication module for BMS connectivity				
159	**Floor Panel**				
	Incomer				
	1 Nos. 160A FP MCCB (25 KA) with microprocessor based with integral protection as per PRMB-2 mentioned in Premable, Class – B transient voltage surge suppression devices suitable for 3 phases as per specification.				
	1 set of R,Y,B phase indicating lamps				
	1 No. (0-500V) Voltmeter with Built-in VSS with 3 nos. 2A SP MCB				
	1 No. (0-150A) Ammeter with ASS with 3 nos. 150/5A CT's				
	1 Set- of ON/OFF/Trip indicating lamps.				
	Bus Bars				
	Electrolytic high conductivity Aluminium three phase and neutral busbars with earthing rated at 200 amps having a maximum current density of 1 amp per sq mm suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity.				
	Outgoings				
	4 No. 32A DP MCB (10 KA)				
	1 No. 40A 4P MCB (10 KA)				
	2 No.63A 4P MCCB (16 KA)				

	Main LT Panel as Described Above	Set	1	59986	59986

S.No	Description of Items	Unit	Qty.	Rate (Rs)	Amount (Rs)
160	**Feeder Piller For External Lighting**				
	Incomer				
	1 Nos. 40A FP MCB (10 KA) MCB.				
	1 set of R,Y,B phase indicating lamps				
	1 No. (0-500V) Voltmeter with Built-in VSS with 3 nos. 2A SP MCB				
	1 No. (0-40A) Ammeter with ASS with 3 nos. 40/5A CT's				
	1 Set- of ON/OFF/Trip indicating lamps.				
	Bus Bars				
	Electrolytic high conductivity Aluminium three phase and neutral busbars with earthing rated at 100 amps having a maximum current density of 1 amp per sq mm suitable to with stand symmetrical fault level of 25 kA at 415 volts. The neutral busbar is to be of 50% capacity.				
	Outgoings				
	3 No. 10A DP MCB (10 KA)				
	Feeder Piller for External Lighting as Described Above	Set	1	41529	41529
	Sub Head - IV : Lighting Fixture & Fan				

	Supply, Installation, testing & Comissioning of Lights fixtures shall be complete with LED lamps, control gear & power factor improvement capacitor complete with all required accessories. Samples of all the fixtures with all available colour shall be submitted to the architect/ client/ Project Manager before supply & approval is taken. Please check the fixtures final quantity from the Architect / Project Manager before ordering and be sure of actual requirement prior to ordering.				
161	Supply & fixing of recess/surface/pendent mounting round 12 to 15 Watt LED Down lighter having powder coated die cast aluminium housing with heat sink, diffuser/reflector and driver ser complete in all respect.	No.	8	2120	16960
162	Supply and fixing of single light wall bracket on matching M.D.F.E.G. Board base etc. complete in all respect.	No.	1	815	815

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
163	Supply and fixing of recess mounting round Ceilling cutout 160 mm height 55 mm 18 Watt LED Down Lighter having Powder coated die cast aluminium housing with heat sink, diffuser/ Reflector and driver set complete in all respect.	No.	102	2350	239700
164	Supply and fixing of water tight oblong 10 Watt LED bulkhead luminaire with driver set confirming to IP 65 and above Protection . complete in all respect.	No.	4	1770	7080
165	Supply and fixing of LED Tube Light with batten suitable for upto 1 X 22 watt LED tube light complete including tube etc on surface complete in all respect.	No.	14	1820	25480
166	Supply & fixing of 36 W recess mounted LED 2x2 light with high efficient LED's, CCT-6500 K,CRI >70, Lumens ≥ 3600, single piece pressure die cast powder coated housing with matt finished opel diffuser for glare free & uniform lighting, Driver shall be of constant current type, operating temperature from -10 to +50 degree celcius, power factor>0.90, rated voltage 220-240V AC working range:- 140-270 V A'c , 50 Hz +_ 5%, AC supply. Surge protection - Inbuilt 5KV, optional 10KV with external Surge Protection device. Complete in all respect with the entire satisfaction of Engineer-in-Charge. (Make of fixture Philips or Equivalent to Wipro,Bajaj, Polycab.	No.	26	5866.00	152516

167	Supply and fixing of LED Street light Fitting having die cast aluminium body and diffuser with driver set suitable for 30Watt. to 40 Watt. Confirming to IP 65 and above protection complete in all respect.	No.	9	6770	60930
168	Supply and fixing of decorative 40 to 45 Watt LED Post top indirect light luminaire having Pressure die cast aluminium body and Clear glass with driver set confirming to IP 65 and above protection complete in all respect.	No.	4	18300	73200
169	Supply, installation, testing & commissioning of 6W LED Tree Uplighter. (Make Polycab) or Equivalent to Trilux, Philips.	No.	16	9359.00	149744
170	Supply of **Ceiling Fan of 1200mm** sweep complete erected in position with all accessories.	No.	2	2622.00	5244

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
171	Supply, instalation, Testing & commissioning of Octagonal G.I. poles with galvanised mounting bracket (1 mtr long Arm) with required accesseries to accomodate street light fitting complete with base plate, finial taper plug, bolts, nuts, junction box within the pole for incoming and outgoing cables (size up to 2 C x 6 Sqmm) and a 10 amps SP MCB and screws as specified in type HM1107 P - **4.0 mtr. Long.** **Bottom diameter-** 150 mm **Top diameter**- 75 mm **Nos of foundation bolts-** 04 **PCD of foundation Bolts-** 240x240 mm **Bolt diameter-** 16mm Rate shall included the cost of inbuilt junction box (weather proof), (6-32A) MCB to fitting with 2.5 sq mm copper wires (2 Nos. 2.5 Sq.mm copper wire for phase & 1 No. 1.5 Sq.mm copper wire for earthing) complete with base plate made from concrete civil foundation works . The pole shall be painted with final PU Paint as required.	Each	9	11591.00	104319
	Sub Head - V: Server, Data & Voice Networking				
172	Supplying and drawing following pair 0.5 sq mm FR PVC insulated annealed copper conductor, unarmored telephone cable in the existing surface/ recessed steel/ PVC conduit as required.				

	2 Pair	Metre	150	19.00	2,850.00
173	Supplying and fixing following **modular switch/ socket** on the existing modular plate & switch box including connections but excluding modular plate etc. as required.				
	Telephone socket outlet	Each	3	96.00	288.00
174	Supplying and fixing following size/ modules, GI box alongwith modular base & cover plate for modular switches in recess etc as required.				
	1 or 2 Module (75mmX75mm)	Each	3	175.00	525.00

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
175	Supply, fixing and concealing 2mm thick PVC conduit pipe with ISI mark embossed and with PVC accessories confirming to IS no. 3419 for drawing wires duly sealed at joints with original resin/adhesive to make the complete piping rigid, plastering with cement sand motar finished to the level with matching colour wash including cost of all material labour and T & P etc required for proper completion of the work as per directions and to the satisfaction of Engineer in charge.				
	25 mm dia 2 mm thick PVC Conduit.	Metre	120	60.00	7,200.00
	32 mm dia 2 mm thick PVC Conduit.	Metre	10	75.00	750.00
176	Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing surface/ recessed steel/ PVC conduit as required.				
	1 run of cable	Metre	60	34	2,040.00
	Supplying, fixing, connecting & testing of **Telephone Tag Block** krone type in a suitable size 1.6 mm thick dust and vermin proof Sheet steel enclosure duly painted by synthetic enamel over anti corrosive primer, lockable and hinged cover with provision for cable through glands complete in all respects.				

177	10 pair Krone	Each	1	1977.00	1,977.00
	Supplying, laying, testing and commissioning of following size anealed tinned copper conductor PVC insulated and sheathed **armoured copper telephone cables** with suitable clamps, saddles and including making terminal joints complete as required.				
178	10 pair	Mtrs	50	237.00	11,850.00
179	Supply,installation, testing & commissioning of a computer data outlet grid plate mounted unit with 1 No. RJ-45 socket, moulded cover plate in recessed GI box complete as required for Data system in existing conduit.(Make- Legrand, Cat no-6755 45)	Each	3	718.00	2154.00
	Equipment				
180	Supply, installation, testing & commissioning of Cat6 IO with Faceplate complet in all respect.	No	4	718.00	2872.00

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
181	Supply, installation, testing & commissioning of 24 port loaded Patchpanel for Data complet in all respect.	No	1	15502.00	15502.00
182	Supply, installation, testing & commissioning of Cat6 patchcord 1 mtr User Side complet in all respect.	No	4	494.00	1976.00
183	Supply, installation, testing & commissioning of Cat6 patchcord 2 mtr Rack Side complet in all respect.	No	4	653.00	2612.00
	Sub Head-VI : Cable & End Terminations				

184	Supplying and laying of aluminium conductor PVC insulated armoured served sheathed cable 1100V grade at a depth of 750mm below ground level over a cushion of 75mm thick sand all around the protected with burnt bricks on sides and on top.On surface/ cable tray the cable run shall be fix on M.S. clamps etc. of suitable size or as directed by engineer incharge, complete in all respect. The armouring of the cable shall be properly connected with the earth conductor by clamp etc.				
	2 core 6 sq. mm	Metre	250	263.00	65,750.00
	4 core 6 sq. mm	Metre	100	295.00	29,500.00
	4 core 10 sq. mm	Metre	20	325.00	6,500.00
	3.5 core 35 sq. mm	Metre	100	448.00	44,800.00
185	Supplying and laying of brass nickle plated compression gland for PVC insulated & armourd served sheathed, under ground cable including rubber ring etc. complete in all respect. The armouring of the cable shall be properly connected with the earth as per direction of ingineer in charge.				
	2 core 6 sq. mm	Each	10	72	720.00
	4 core 6 sq. mm	Each	2	72	144.00
	4 core 10 sq. mm	Each	2	80	160.00
	3.5 core 35 sq. mm	Each	2	152.00	304.00

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
186	Supplying and fixing of plain orpin type copper tin plated cable socket (Lug) to the cable leads, insulating with tape & making connection etc. complete in all respect as per direction of the Engineer Incharge.				

	4 sq. mm	Each	20	15	300.00
	6 sq. mm	Each	8	15	120.00
	10 sq. mm	Each	8	20	160.00
	35 sq. mm	Each	6	32	192.00
	Sub Head -VII : Earthing Work				
187	Supplying and burying of 600mmx600mmx6.0mm G.I. plate vertically for earthing with its top at least 3 metre below ground level complete with 20mm dia G.I. pipe for watering and earthing lead of no. 8 to 10 SWG GI wire in 15 mm dia GI pipe up to switch board(and from appron to switch board the cost of GI pipe & G.I. wire will be extra) 30 cm square CI box with hinged cover masonary housing alternate layers of charcoal/coke & salt atleast 150mm thick around etc as per direction of engineer in charge complete in all respect as per drawing.	Each	2	4730.00	9,460.00
188	Supplying and laying of 25mmx3mm G.I. strip from earth electrode directly in the ground as required complete in all respect.	Metre	25	82.00	2,050.00
189	Supplying and laying of 32mmx6mm G.I. strip from earth electrode directly in the ground as required complete in all respect.	Metre	25	142.00	3,550.00
190	Supplying and fixing of one number 8 SWG G.I. wire in 15mm dia G.I. pipe for earthing, laid in ground or in wall duly concealed including the cost of cement, sand, labour, T & P other material required for proper completion of the work as directed at site.	Metre	150	157.00	23,550.00
	Sub-Head -VIII : Conventional Fire Alarm & Detection System				
	Supplying, installation, testing and commissioning of following fire alarm & detection system complete in all respect as per specifications :				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**

191	Providing,fixing, testing and commissioning of Conventional fire alarm control and **indicating panel,microprocessor based with RS 485 communication**, pulser, timer for dual stage alarm facility complete with indicators, floor selector switches, stand by SMF lead acid battery (suitable for 48 hours normaloperation & after that min. 30 minutes for full load operation),battery charger,battery box,connections to building automation system/ Firefighting pump panel etc. as required, complete in all respect as per specifications and requirements.The panel shall have facility of automatic dialling to 5 telephone numbers in case of alarm. The main control panel should give a distinct visual signal of the isolation of zone from the local indication panel. If all the zones at the local panel are isolated or if the fuse of the LCP gets blown, it should result in an open circuit fault indication at the Main Panel. Each zone should have provision of activation of hooter.The Panel shall be provided with suitable Nos. No./NC Potential free contacts for control modules as per site rquirement and as per quantity specified above.(8 Zone Panel).	Nos.	1	29028.00	29,028.00
192	Providing, fixing, testing and commissioning of resettable type **manual call points** as per specifications.The manual call point should have an indicator, which should "blink" in stand by condition.	Nos.	8	1707.00	13,656.00
193	Providing, fixing, testing and commissioning of electronic hooters with LMT (hooters shall also be able to work as public address systemsounders) housed in sheet steel / Polymer housing suitable for wall /ceiling and surface / recess mounting including making connectionswith wires complete in all respects and as per specifications.	Nos.	8	1984.00	15,872.00
	Conduits And Cables				
194	Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing surface/ recessed steel/ PVC conduit as required.				
	2 x 1.5 sq. mm	Metre	500	37.00	18500.0
195	Supply fixing and concealing **rigid steel conduit pipe** in the wall including cutting of brick work, laying of conduit and fixing it with M.S. hooks and then plastering with cement, sand motar finished to the level, with matching color wash including cost of proper threading of the conduit and providing necessary sockets, bends and chuck nuts as directed by the engineer-in-charge with supply of all material labour and T&P required for proper completion of work. (for Telephone / Television / circuits)				

S.No	Description of Items	Unit	Qty.	Rate (Rs)	Amount (Rs)
	25 mm dia. conduit (16 SWG) thick	Metre	500	125.00	62,500.00
	Sub-Head -IX : Vertical Transportation (Lift)				
	Delivery complete installation, and testing of elevatots of schindler make,				
196	Schindler 3300IN's Elevator 00100 with Passenger Capacity-12, and 4 stops complete.	Nos.	1	1675681.00	1675681
197	Schindler 3300IN's Elevator 00200 with Passenger Capacity-12, and 2 stops complete.	Nos.	1	1731535.00	1731535
	HVAC Work				
	Equipment:				
	Variable Refrigerant Volume / Flow Air-conditioning System (Heating & Cooling both)				
	Supply, installation, testing and commissioning of Ductable Split ac type air-conditioning system suitable for Cooling by Single/multiple scroll compressor complete with indoor and outdoor units with individual wired and wireless/wired remote controller for indoor units , interconnecting refrigerant piping, full charge of refrigerant gas (R-410A) & oil, control cabling and fittings etc. as per details given in specifications and having following items. The out door units shall be suitable for 3 phase 4 wire system, 415V + 10 %, 50 Hz AC supply and indoor shall be suitable for Single phase 220-240V, 50 Hz AC supply.				
	Outdoor Units				

	Supply, installation, testing & commissioning of outdoor units equipped with highly efficient scroll compressors, heat exchanger, low noise condenser fan, auto check function for connection error, auto address setting and capacity as mentioned below including all hardware & accessories & including full charging of R-410A refrigerant gas complete i/c powder coating complete as per specifications. The units should be with necessary weather protection coating. The coating should be done before bringing the units to site. Out door units shall be provided with MS stand of suitable size duly painted with corision resistant paint suitable for outdoor application.				
198	6.0 HP ODU capacity	EACH	2	133165	266330

S.No	Description of Items	Unit	Qty.	Rate (Rs)	Amount (Rs)
	Ductable Units with In built drain pump				
	Supply, Assembly, Erection, Testing and Commissioning of Ceiling suspended ductable Units with fittings. Three speed motor, turbo fans of multi blade type, duly statically and dynamically balanced to give the required air flow, filter, coil section with DX coil, outer cabinet, insulated drain pan, provided with drain pump with safety cutouts, including all accessories. Cable from IDU unit to socket and headers etc. complete as required.Cost of Unit shall also include cost of drain pump.				
199	6.0 TR Ductable Units with In built drain pump	EACH	2	112541	225082
	Corded Remote Controller				
	Supply, installation, testing & commissioning of Wired Remote controllers suitable for above indoor units to operate, monitor, ON/OFF, temperature setting, 3 step air flow changing etc. The remote controller shall be suitable for wall mounting with bracket.				
200	Wired Remote Controller	EACH	2	1739	3478
	Refrigerant & Drain Piping:				

	Supplying & Installation of interconnecting following sizes of Refrigerant Copper Pipe work of following outer diameter, insulated with 19/13 mm thick closed cell electrometric nitrile rubber tubular insulation between Each set of indoor & outdoor units with factory laminated aluminium cladding to offset the impact of mechanical injury and scratch resistance for all pipes as per specification all piping inside the building shall be properly fixed/supported with suitable size of clamp/ M.S. hanger.				
201	9.5 mm dia with 13mm thick nitrile rubber insulation	Rmt	40	465	18600
202	19.1 mm dia with 19mm thick nitrile rubber insulation	Rmt	40	747	29880
203	Providing & fixing control cum transmission wiring of 3 core x 1.5 sqmm copper in suitable 25 mm dia heavy duty PVC conduits or wall chase or refrigerant piping between indoor units and outdoor units and indoor units and wired controllers.	Rmt	40	226	9040
	Condensate Drain Piping				
	Supply installation, testing and fixing of Class'B' PVC pipes,drain piping complete with 6 mm thick nitrile rubber insulation fittings, supports as per specifications.				

S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
204	25 mm dia	Rmt	13.04	93	1212.72
	Air Distribution (For Factory Fabricated Ducts As Per "SMACNA" Standards & Specifications)				
205	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as required.				
	0.63 MM (24 gauge) Galvanized Sheet Steel Ducting	Sqmt.	70.0	630	44100
206	Supply, installation, testing and commissioning of GI volume control duct damper complete with neoprene rubber gaskets, nuts, bolts, screws linkages, flanges etc., as per specifications.	Sqmt	1.04	5463	5681.52

207	Supplying, fixing testing commissioning of supply air diffusersof powder coated aluminium with aluminium volume controldampers with anti smudge ring & removable core.	Sqmt	4.14	8686	35960.04
208	Supplying, fixing testing commissioning of Return air diffusers of powder coated aluminium without volume control dampers with anti smudge ring & removable core.	Sqmt	3.31	5619	18598.89
209	Supplying and fixing of following thickness duly laminated aluminum foil of mat finish closed cell Nitrile rubber (Class —Oll) insulation on existing duct after applying suitable adhesive for Nitrile rubber. The joints shall be sealed with 50 mm wide and 3 mm thick self adhesive nitrile rubber tape insulation complete as per specifications and as required.				
	19 mm	Sqmt	70.0	821	57470
210	Supply, fabrication, installation and testing the non-porous **flexible connections** constructed of fire resistance flexible, double canvas connection with resistoflex material as per the approved shop drawings.	Sqmt	0.47	3955	1858.85
S.No	**Description of Items**	**Unit**	**Qty.**	**Rate (Rs)**	**Amount (Rs)**
211	Supply & fixing of **Acoustic insulation** for Supply air duct using 10 mm thick class 1 rating Open cell nitrile rubber elastomeric insulation with density of 140 - 180 kg / m^3. The insulation manafactured as per BS 476 Part 7 & which should also meet UL 94test supplementary materials for air distribution system which should not absorbs less 0.2% water by volume (ASTM c 209), should not support microbial growth (ASTM 2180, G21, G22) and should not emit objectionable odors (ASTM C 665) and should have thermal conductivity of 0.04W/m K @ 20 degC as per DIN EN 12667. and water vapor permeance of 0.10. Adhesive shall be used additionally with VOC level not exceeding 50 grms / Litre.	Sqmt	13.50	725	9787.50
Total in figures					**28722418**
Quoted rate in figures			**Select**		

Quoted rate in words					

Please Note: The Bidder is required to fill only blue cells in the BOQ as highlighted above

Note:

a. The Bidder with the lowest quoted cost for Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida in the financial quote (L1 bidder) shall be selected for the award of contract.
b. The Bidder shall be required to quote the percentage in the BOQ.
c. The Bidder shall abide by the approved makes mentioned in the tender document.
d. The Financial Bid submitted is unconditional (inclusive of all taxes including GST, duties, levies, etc. as applicable) and fulfills all the requirements of the TOR Document.
e. The Bidder shall furnish his rates including Labour Cess @ 1% and Water Cess @1%. The same shall be deducted from the bills of the contractor. The royalty charges levied by stats/central govt. on & other terms and conditions issued time to time by govt. shall abide by and shall be paid by contractors and its proof shall have to be submitted to Corporation.
f. We have completely read and understood the Bid Document. The Financial Tender submitted is unconditional and fulfills all the requirements of the Tender Document.

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

_____

Signature and Name of the Authorized Person

_____

NAME OF THE BIDDER AND SEAL

RFP for Addition and Alteration of Hall (3rd Floor) and Proposed Entrance for NMRC Office at Ganga Shopping Complex, Sector 29, Noida

8.17. Form 15: Bid Details

The following list is intended to help the tenderers in submitting offer which are complete. An incomplete offer is liable to be rejected. Tenderers are advised to go through the list carefully and take necessary action.

S.No.	Particulars	Attached Yes / No / Not Applicable	Page no. (Mandatory)
1	Bid Processing Fees		
2	Earnest Money Deposit		
3	Form 1: Letter of Proposal Submission		
4	Form 2: Firm Details		
5	Form 3: Capability Statement		
6	Form 4: Work Experience		

7	Form 5: Financial Capability Details		
8	Form 6: Memorandum		
9	Form 7: Undertaking - 1		
10	Form 8: Power of Attorney		
11	Form 9: Banker‘s Solvency Certificate		
12	Form 10: General Guidelines for Fixing Requirement of Technical Staff for Work		
13	Form 11: Proforma for Equipment available		
14	Form 12: Salable Form for Tender Document		
15	Form 13: Declaration of Refund of Earnest Money		
16	Statutory proof of existence as the legal entity		
17	A copy of the Annual Reports (Profit and Loss Account and Balance Sheet) for the last 3 (three) Financial Years of Bidder		
18	A self-attested copy of current valid ITR		
19	A self-attested copy of PAN, GST registration		
20	Character certificate issued by District Magistrate		
21	Any other document asked by the Purchaser if submitted, specify the documents Or Any other document which the Tenderer considers relevant		

NOIDA METRO RAIL CORPORATION LTD.

(A joint venture of Govt. of India and Govt. of U.P.)

GENERAL CONDITIONS OF CONTRACT

(July 2018)

NOIDA METRO RAIL CORPORATION LTD.
Block – III, 3rd Floor, Ganga Shopping Complex,
Sector-29, Noida – 201 301,
District Gautam Budh Nagar, Uttar Pradesh, India

Content

1. Definitions and interpretations

1.1. Definitions In the contract (as defined below) the words and expressions defined below shall have the meanings assigned to them, except where the context requires otherwise. Words indicating persons or parties include corporations and other legal entities except where the context requires otherwise.

1.1.1. Documents

1.1.1.1. "Appendix to Form of Tender" means the completed pages in title Appendix, which are appended to and form part of the Tender.

1.1.1.2. "Bill of Quantity" means a document containing various items of payment and contains schedule of Payment also.

1.1.1.3. "Construction and/or Manufacture Documents" means all drawings, calculations, computer software (programs), samples, patterns, models, operation and maintenance manuals, and other manuals and information of a similar nature, to be submitted by the Contractor.

1.1.1.4. "Contract" means the Contract Agreement, the Notice of Award, the letter of tender, General Conditions of Contract, Special Conditions of
Contract, the Employer's Requirements, the Tender, the Notice Inviting Tender, Instructions to Tenderers, the Contractor's Proposal, the Schedules, and such further documents which are listed in the Notice of Award or Contract Agreement (if completed).

1.1.1.5. "Contract Agreement" means the contract agreement referred to in Sub-Clause 1.4. It shall also include all subsequent modifications/ amendments to the Contract as a result of the communications or negotiation proceedings between the parties.

1.1.1.6. "Contractor's Proposal" means the proposal submitted by the Contractor with the Tender, as modified and accepted by the Employer and included in the Contract. Such documents may include the Contractor's preliminary design.

1.1.1.7. "Contractor's Document" means the calculations, computer programme and other software, drawings, manuals and other documents of a technical nature (if any) supplied by the Contractor under the Contract.

1.1.1.8. "Design Data" means all specifications, plans, drawings, details, graphs, sketches, models, levels, setting-out dimensions, calculations duly checked by the Contractor and other documents relating to the design of the Works prepared or to be prepared by or on behalf of the Contractor.

1.1.1.9. "Drawings" means the Employer's Drawings and the Drawings submitted by the Contractor and any modification of such drawings as any, from time to time, be furnished or for which the Engineer has issued a Notice of No Objection.

1.1.1.10. "Employer's Requirements" means the description of the scope, standard, design criteria, specifications, drawings, programme of work, indigenisation programme (where applicable) as included in the Contract, and any alterations and modifications thereto in accordance with the Contract.

1.1.1.11. "Interim Payment Schedule" means the schedule included for each Cost Centre in the Pricing Document and accepted by the Employer to be used for interim payments in relation to achievement of milestones under that Cost Centre, as the same may be revised from time to time in accordance with Clause 11.

1.1.1.12. "Notice of Award" means the written notice issued by NMRC to the Selected Bidder(s) intimating the acceptance of Selected Bidder's Proposal for the award of Contract

1.1.1.13. "Notice to Proceed" means the notice issued by the Employer to the Contractor communicating the date on which the Works are to be commenced.

1.1.1.14. "Letter of Tender" means the document entitled letter of tender, which was completed by the Contractor and includes the signed offer to the Employer for the Works.

1.1.1.15. "Safety, Health and Environmental (SHE) Manual" means the Employer's manual containing the requirements and conditions to be met during the execution of the Works by the Contractor.

1.1.1.16. "Schedules" means the information and data submitted with the Tender, as included in the Contract.

1.1.1.17. "Tender" means the Contractor's priced offer to the Employer for the designing where ever applicable, execution, manufacture, and completion of the whole of Works, testing and commissioning (including Integrated Testing and Commissioning where ever applicable) and remedying of any defects therein, as accepted by the Letter of Acceptance.

1.1.1.18. "Schedule of Milestones" means the schedule included in each Cost Centre in the Pricing Document, describing the Milestones and stipulating dates by which the Milestones are to be achieved under that Cost Centre in order to maintain interim payments by the Employer to the Contractor in accordance with the Interim Payment Schedule for that Cost Centre, as the same may be revised from time to time in accordance with the Contract.

1.1.1.19. "Schedule of Payment" means the schedule included in the Bill of Quantity for payment in various stages on part of the works.

1.1.1.20. "Special Conditions of Contract" means any special conditions of contract issued by the Employer prior to submission of the Tender or negotiated and agreed in writing by the Employer and the Contractor prior to and conditional upon acceptance of the Tender.

1.1.1.21. "Works Programme" means the programme showing the sequence, method and timing of investigations, design, issue of No Objection Notices, execution, manufacture, delivery to site, erection, installation, testing, commissioning of the Works (including Integrated Testing and Commissioning), indigenisation (where applicable) and related activities in the form and content prescribed by the Employer's Requirements, or any amended or varied version thereof, as submitted by the Contractor and for which the Engineer has issued a Notice of No Objection.

1.1.2. Persons

1.1.2.1. "Party" means the Employer or the Contractor as the context requires "Tenderer or Bidder" means the person submitting a bid/Tender.

1.1.2.2.

1.1.2.3. "Contractor" means the person whose Tender has been accepted by the Employer and the legal successors in title to such person, but not (except with the consent of the Employer) any assignee of such person.

1.1.2.4. "Contractor's Representative" shall mean a person named by the Contractor in the Contract or appointed from time to time by the Contractor under Sub-clause 4.3 to act on behalf of Contractor.

1.1.2.5. "Designated Contractors" means any of the following whose activities or the works they are engaged to carry out, affect or are affected by the Works, in any way or at any time:

a. Contractors, design consultants and utility authorities engagedon the Project from time to time by the Employer;

b. Sub-contractors of any tier of the contractors above; providedthat the definition shall exclude the Contractor and his subcontractors of any tier in relation to the Works.

1.1.2.6. "Other Contractor" means a person employed by or having Contract directly or indirectly with the Employer otherwise than through the Contractor.

1.1.2.7. "Designer" means the Contractor, or part of the group forming the contractor, person, firm or company or group of companies, or any replacement, carrying out the Design of Works or part thereof.

"Employer" means NOIDA METRO RAIL CORPORATION LIMITED

1.1.2.8. (NMRC), its legal successors and assignees.

1.1.2.9. "Engineer" means any person nominated or appointed from time to time by the Employer to act as the Engineer for the purposes of the Contract and notified as such in writing to the Contractor.

1.1.2.10. "Engineer's Representative" means any Assistant of the Engineer appointed from time to time by the Engineer under Sub-clause 3.3.

1.1.2.11. "Sub-contractor" means any person named in the Contract as a subcontractor, manufacturer or supplier for a part of the Works or any person to whom a part of the Works has been sub-contracted with the consent of the Employer and the legal successors in title to such person, but not any assignee of such person.

1.1.3. Dates, Times and Periods

1.1.3.1. "Commencement Date" means the date on which the Contractor shall commence the Works on the written instructions of the Employer contained in the Notice to Proceed.

1.1.3.2. "Contract Period" means the period from the Commencement Date to the end of Defects Liability Period including Integrated Testing and Commissioning and as certified by the Engineer under Clause 7.11 (or as extended under Sub-Clause 10.3).

1.1.3.3. "Day" means a calendar day, "Week" means 7 calendar days, and "Month" means a calendar month and "Year" means 365 days.

1.1.3.4. "Effective Date" means the date on which the Contract comes into force and effect

1.1.3.5. "Gazetted Holiday" means every holiday which is observed by Noida Metro Rail Corporation Limited as a gazetted holiday as well as a weekly holiday.

"General Holiday" means Sunday.

1.1.3.6.

"Key Date" means a date identified as such in the Contract.

1.1.3.7.

1.1.3.8. "Milestone" means the completion of a part of the Works or the occurrence of an event identified as such in the Schedule of Milestones.

1.1.3.9. "Milestone Date" means the date prescribed in the Schedule of Milestone by which a Milestone is to be achieved if Interim Payments for the Cost Centre in which the Milestone is included are not to be suspended.

1.1.3.10. "Stage" means level of progress of the works identified as such and more particularly described in the Employer's Requirements for which a Key Date for the achievement thereof is stipulated in the Contract.

1.1.3.11. "Time for Completion" means the time for completing the Works or a section or a part thereof (as the case may be), and passing the Tests on Completion,

including Integrated Testing and Commissioning, as stated in the contract, calculated from the Commencement Date.

1.1.4. Tests and Completion

1.1.4.1. "Factory Tests" means the tests required to be carried out in the factory premises on components, equipment, subsystem, system, etc. during and/or after manufacture in the factory.

1.1.4.2. "Integrated Testing" in the contracts where applicable means the programme of tests performed by the Contractor at the direction of the Engineer following satisfactory completion of Contractor's tests on his equipment, sub-systems or system to verify and confirm the compatibility and compliant performance of his equipment/ subsystem/ system with the equipment/ sub-system/ system provided by others.

1.1.4.3. "Milestone Certificate" means the certificate to be issued by the Engineer in relation to the achievement or otherwise of Milestones.

1.1.4.4. "Performance Certificate" means the certificate issued by the Engineer under Sub-Clause 10.9.

1.1.4.5. "Taking Over Certificate" means a certificate issued under Clause 9.1.

1.1.4.6. "Tests on Completion" means the tests specified in the Contract and designated as such, including Integrated Testing where applicable and any other such tests as may be agreed by the Engineer and the Contractor, or instructed as a Variation, which are to be carried out before the Works, or any Section are taken over by the Employer.

1.1.5. Money and Payments

1.1.5.1. "Contract Price" means the sum stated in the Notice of Award as payable to the Contractor, subject to such additions thereto or deductions therefrom as may be made under the provisions of the Contract.

1.1.5.2. "Cost" means all expenditure properly incurred (or to be incurred) by the Contractor, whether on or off the Site.

1.1.5.3. "Cost Centre Amount" means the amount apportioned to a Cost Centre as set out in the Pricing Document, as the same may be revised from time to time in accordance with the Contract.

1.1.5.4. "Final Payment Certificate" means the payment certificate issued by the Engineer under Sub-Clause 11.9.

1.1.5.5. "Final Statement" means the agreed statement defined in SubClause 11.10.

1.1.5.6. "Foreign Currency" means a freely convertible international trading currency in which part of the Contract Price is payable, but not the Local Currency.

1.1.5.7. "Interim Payment Certificate" means any payment certificate issued by the Engineer under Sub-Clause 11.5, other than the Final Payment Certificate.

1.1.5.8. "Local Currency" means Indian Rupees.

1.1.6. Other Definitions

1.1.6.1. "Approval or Approved" means Approval in writing including subsequent written confirmation of previous verbal approval.

1.1.6.2. "Contractor's Equipment" means all machinery, apparatus, appliances, other things of whatsoever nature required for purpose of the Contract, including without limitation, Contractor's Plant and Equipment, or Materials to or from the Site, but does not include Plant, or Materials intended to form or forming part of the Permanent Works.

1.1.6.3. "Cost Centre" means a group of activities and/ or items of work identified as such in the Pricing Document.

1.1.6.4. "Materials" means things of all kinds (other than Plant) to be provided and incorporated in the Permanent Works by the Contractor, including the supply-only items (if any), which are to be supplied by the Contractor as specified in the Contract.

1.1.6.5. "Plant" means the machinery, equipment, and apparatus and the likes, intended to form or forming part of the Permanent Works, including the supply-only items (if any), which are to be supplied by the Contractor as specified in the Contract.

1.1.6.6. "Section" means a part of the Works specifically designated in the Appendix to Form of Tender as a Section (if any).

1.1.6.7. "Site" means the places provided by the Employer where the Works are to be executed and to which Plant, Rolling Stock and Materials are to be delivered, and any other place as may be specifically designated in the Contract as forming part of the Site. Site includes Depot, where Rolling Stock will be delivered, tested and commissioned as provided in the Contract.

1.1.6.8. "Scheduled Bank" means a bank included in the second schedule to the Reserve Bank of India Act, 1934, or modifications thereto.

1.1.6.9. "Specification" means the Specification referred to in the contract and any modification thereof or addition thereto, as may from time to time be furnished or approved in writing by the Engineer.

1.1.6.10. "Test" means such Tests as are prescribed in the Specifications or by the Engineer or Engineer's Representative, whether performed by the Contractor or by the Engineer or his Representative or any agency acting under the direction of the Engineer.

1.1.6.11. "Variation" means any alteration and/ or modification to the Employer's Requirements, which is instructed by the Engineer or approved as a variation by the Engineer, in accordance with Clause 12.

1.1.6.12. "Works" means the work, both permanent and temporary, or services to be carried out, designed, manufactured, fabricated, delivered to Site, erected, installed, completed, tested, commissioned, (including Integrated Testing and Commissioning) and remedying of any defects, and/ or supplied in accordance with the Contract and include Plant, Rolling Stock and Materials and their accessories.

1.1.6.13. "Permanent Works" means the permanent works to be designed and executed in accordance with the Contract.

1.1.6.14. "Temporary Works" means all temporary works of every kind (other than Contractor's Equipment) required for the execution and completion of the Works, and the remedying of any defects.

"Project" means Noida – Greater Noida Metro Corridor project
1.1.6.15.

In the Contract except where the context requires otherwise

1.2. Interpretation

1.2.1.1. a. words indicating one gender include all genders;

b. words indicating the singular also include the plural and wordsindicating the plural also include the singular and

c. "written" or "in writing" means hand-written, type written,printed or electronically made and resulting in a permanent record.

The marginal words and other headings shall not be taken into consideration in the interpretation of these condition.

Terms and expressions not herein defined" shall have the meanings assigned to them in the "Indian General Clauses Act, 1897" or the Indian Contract Act or the Indian Sale of Goods Act or any other applicable Indian Law, as the case may be.

1.3. Law and Language

The contract shall be governed by the Acts and Laws of India, the rules, regulations and bye-laws of the concerned public bodies and authorities. Language of the Contract shall be English.

1.4. Contract Agreement

The Employer and the Contractor shall execute a Contract Agreement, with such modifications as may be necessary to record the Contract. The costs of stamp duties and similar charges imposed by law shall be borne by the Contractor.

1.5. Priority of Documents

The documents forming the Contract are to be taken as mutually explanatory of one another. If there is an ambiguity or discrepancy in the documents, the Engineer shall issue any necessary clarification or

1.6. Care of Supply of Construction and/or Manufacture

Documents instruction to the Contractor, and the priority of the documents shall be as follows:

a. The Contract Agreement
b. The Notice of Award
c. Pre and Post bid proceeds
d. Form of Tender
e. BOQ/Payment schedule
f. NIT
g. ITT
h. The Outline Design Specifications (Design Criteria) and Outline Construction Specifications; or any other specification
i. Drawings
j. The Employer's Requirements
k. The Special Conditions of Contract;
l. The General Conditions of Contract;
m. The Contractor's Proposal; and
n. Any other document forming part of the Contract.

The Construction and/or Manufacture Documents shall be in the custody and care of the Contractor during the Contract. Unless otherwise stated in the Employer's Requirements, the Contractor shall provide three copies for the use of the Engineer and assistants (as referred to in Sub-Clause 5.3).

The Contractor shall keep on Site one complete set of the documents forming the Contract, the Construction and/or Manufacture Documents, Variations, other communications given or issued from time to time and the documents/samples mentioned in Sub-Clause 5.3. The Employer, the Engineer and their assistants (as referred to in Sub-

Clause 3.3) shall have the right to access these documents all reasonable times.

On discovery of any technical error or defect in a document intended to be used for the purpose of Contract, the Contractor shall promptly give notice to the Engineer of such error or defect.

1.7. Communications

Communications between parties, unless otherwise specified shall be effective only when made in writing. A notice will be effective only when delivered.

1.8. Employer's Use of Contractor's Documents

As between the Parties, the Contractor shall retain the copyright and other intellectual property rights in the Contractor's Documents and other design documents made by (or on behalf of) the Contractor.

The Contractor shall be deemed (by signing the Contract) to give to the Employer a non-terminable transferable non-exclusive royalty-free licence to copy, use and communicate the Contractor's Documents, including making and using modifications of them. This licence shall:

a. apply throughout the actual or intended working life (whicheveris longer) of the relevant parts of the Works,

b. entitle any person in proper possession of the relevant part ofthe Works to copy, use and communicate the Contractor's Documents for the purposes of completing, operating, maintaining, altering, adjusting, repairing and demolishing the Works, and

c. In the case of Contractor's Documents which are in the formof computer programs and other software, permit their use on any computer on the Site and other places as envisaged by the Contract, including replacements of any computers supplied by the Contractor.

1.9. Contractor's Use of Employer's Documents

As between the Parties, the Employer shall retain the copyright and other intellectual property rights in the Employer's Requirements and other documents made by (or on behalf of) the Employer. The Contractor may, at his cost, copy, use, and obtain communication of these documents for the purposes of the Contract.

They shall not, without the Employer's consent, be copied, used or communicated to a third party by the Contractor, except as necessary for the purposes of the Contract.

1.10. Compliance with Statutes, Regulations and Laws

The Contractor shall familiarise themselves and conform in all aspects with:

a. the provision of any enactment in India as applicable from time to time

b. the regulations or bye-laws of any local body and utilities.

c. The Contractor shall be bound to give all notices required bystatute, regulations or by-laws, as aforesaid and to pay all fees and bills payable in respect thereof. The Contractor will arrange necessary clearances and approvals before the Work is taken up.

Ignorance of Rules, Regulations and Bylaws shall not constitute a basis for any claim at any stage of work

The Contractor shall indemnify the Employer against all penalties and liabilities of every kind of breach of any such enactment, laws, regulations, bye-laws or rules.

1.11. Joint and Several Liability

If the Contractor is (under applicable Laws) a joint venture, consortium, or other incorporated grouping of two or more Persons:

a. these Persons shall be deemed to be jointly and severallyliable to the Employer for the performance of the Contract;

b. these Persons shall notify the Employer of their leader whoshall have authority to bind the Contractor and each of these persons; and

c. the Contractor shall not alter its composition or legal statuswithout the prior consent of the Employer.

2. The Employer

2.1. General Obligations

The Employer shall provide the Site/area of works and shall pay the Contractor in accordance with the Contract.

2.2. Access to and Possession of the Site

The Employer shall grant the Contractor right of access to, and or possession of, the Site progressively for the completion of Works. Such right and possession may not be exclusive to the Contractor. The Contractor will draw/modify the schedule for completion of Works according to progressive possession/right of such sites.

If the Contractor suffers delay from failure on the part of the Employer to grant right of access to, or possession of the Site, the Contractor shall give notice to the Engineer in a period of 28 days of such occurrence. After receipt of such notice the Engineer shall proceed to determine any extension of time to which the Contractor is entitled and shall notify the Contractor accordingly.

For any such delay in handing over of site, Contractors will be entitled to only reasonable extension of time and no monetary claims whatsoever shall be paid or entertained on this account.

2.3. Permits, Licences or Approvals

It shall be Contractor's exclusive responsibility to get approvals, permits or license required for the Contract. However, the Employer may (where he is in a position to do so) provide reasonable assistance to Contractor at the request and cost of the Contractor in getting Permits, License or Approvals required during the Contract.

The rendering of such assistance by the Employer shall not be interpreted as a pretext by the Contractor as condoning of any delay or non-performance of any of the Contractors obligations. The following-up of all such applications shall be the responsibility of the Contractor.

2.4. Assignment by Employer

The Employer shall be fully entitled without the consent of the Contractor, to assign the benefit of the part thereof and any interest therein or there under to any third party.

3. The Engineer

3.1. Appointment of Engineer

The Employer shall notify the Contractor in writing of the appointment and identity of the Engineer and of any replacement from time to time.

3.2. Duties and Authorities of Engineer

The Engineer shall carry out the duties specified in the Contract. The Engineer shall have no authority to amend the Contract.

The Engineer may exercise the authority specified in, or necessarily to be implied from the Contract. If the Engineer is required to obtain the specific approval of the Employer before exercising such authority, such requirements shall be as stated in Special Conditions of Contract. Any requisite approval shall be deemed to have been given by the Employer for any such authority exercised by the Engineer.

The Engineer shall have no authority to relieve the Contractor of any of his duties, obligations, or responsibilities under the Contract. Any proposal, inspection, examination, testing, consent, approval or similar act by the Engineer (including absence of disapproval) shall not relieve the Contractor from any responsibility, including responsibility for his errors, omissions, discrepancies, and non-compliance with Sub-Clause 5.4.

The Engineer shall copy to the Employer all communications given or received by him in accordance with the Contract.

3.3. Engineer's Authority to Delegate

The Engineer, may from time to time assign and delegate authority to Engineer's representatives/assistants and may also revoke such assignments and delegations. The delegation or revocation shall be in writing and shall be applicable only after same has been notified in writing to the Contractor.
Each Assistant to whom duties have been assigned or authority has been delegated, shall be authorized to issue instructions to the Contractor to the extent defined by the delegation. Any determination, approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test or similar act by an assistance shall have the same effect as though the act had been an act of the Engineer. However:

a. Any failure to disapprove any Plant, Goods, Material, designand workmanship shall not prejudice the right of the Engineer to reject such Plant, Goods, Material, design and workmanship;

b. if the Contractor questions any determination or instruction ofan assistant of the Engineer, the Contractor may refer the matter to the Engineer within three days of such decision having been given, who shall confirm, reverse or vary such determination or instruction.

3.4. Engineer's Instructions

The Contractor shall comply with instructions given by the Engineer in accordance with the Contract.

The Contractor shall give reasonable notice to the Engineer of any instruction, which he considers necessary for the execution of the Works, to enable the Engineer to issue the instruction so that progress of the Works is not delayed. The Engineer shall not, however, be bound to issue any instruction which, in his opinion, is unnecessary.

No act or omission by the Engineer or the assistants to the Engineer in the performance of any of the Engineer's duties or the exercise of any of the Engineer's powers under the Contract shall, in any way, operate to relieve the Contractor of any of the duties, responsibilities, obligations or liabilities imposed upon the Contractor by any of the provisions of the Contract.

3.5. Engineer to Attempt Agreement

When the Engineer is required to determine value, cost or extension of time, he shall consult with the Contractor and the Employer in an endeavour to reach agreement. If agreement is not achieved, the Engineer shall determine the matter fairly, reasonably and in accordance with the Contract, with the approval of Employer.

4. The Contractor

4.1. General Obligations

The Works as completed by the Contractor shall be wholly in accordance with the Contract and fit for the purposes for which they are intended, as defined in the Contract. The Works shall include any work which is necessary to satisfy the Employer's Requirements, the Contractor's Proposal and Schedules, or is implied by the Contract, or arises from any obligation of the Contractor, and all works not mentioned in the Contract but which may be inferred to be necessary for stability, or completion, or the safe, reliable and efficient operation of the Works.

The Contractor shall design, if in the scope of work, manufacture, execute, install, complete, test (including Integrated Testing in case of rolling stock and signaling contracts) and commission, the Works, including providing Construction and/or Manufacture Documents, within the Time for Completion and shall remedy any defects within the Contract Period. The Contractor shall provide all superintendence, labour, Plant, Materials, Contractor’s Equipment, Temporary Works and all other things, whether of a temporary or permanent nature, required in and for such design, works and remedying of defects.

Before commencing design, if in the scope of the contract, the Contractor shall satisfy himself regarding the Employer's Requirements (including design criteria and calculations, if any) and the items of reference mentioned in Sub-Clause 4.8.

The Contractor shall give notice to the Engineer of any error, fault or other defect in the Employer's Requirements or such items of reference. After receipt of such notice, the Engineer shall determine whether Clause 12 shall be applied and shall notify the Contractor accordingly.

The Contractor shall take full responsibility for the adequacy, stability and safety of all Site operations, of all methods of construction, manufacture, and of all the Works, irrespective of any approval or consent by the Engineer.

The Contractor shall be deemed to have satisfied himself before submitting his tender as to the correctness and sufficiency of his Tender to cover all his risks, liabilities and obligations set out in or implied by the Contract and all matters and things necessary for the proper design, manufacture, execution, installation, completion, testing, Integrated Testing whichever is in the scope of the contract, commissioning of the Works and remedying of the Defects.

The Contractor acknowledges responsibility for ascertaining and securing at his own cost:

a. conditions bearing upon the proper transportation, disposal,handling and storage of materials (including but not limited to hazardous toxic substances and excavated materials);

b. availability of electricity, water and gas;

c. availability of skilled manpower;

d. the character of equipment and facilities needed preliminary toand during the manufacture, installation, execution, testing, Integrated Testing, and commissioning of the Works and remedying of any defects;

e. the protection of the environment and adjacent structures whichwill be necessary preliminary to and during the manufacture, installation, execution, testing, Integrated Testing, and commissioning of the Works and remedying of any defects;

f. the location of and the authorisation required for and the means of diversion of any services and facilities required for the purposes of the Works.

The Contractor shall whenever required by the Engineer, submit details of the arrangement and methods which the Contractor proposed to adopt for the execution of the Works. No alteration to these arrangements or methods shall be made without the approval of the Engineer.

4.2. Performance security

4.2.1. Amount Within 30 days of receipt of the Notice of Award, the successful Tenderer shall furnish Performance Security in the form of a bank guarantee from a branch in India of a scheduled foreign bank or from a scheduled commercial bank in India acceptable to the Employer for an amount of ten per cent of the Contract value in types and proportions of currencies in which the Contract Price is payable The approved form provided in the "Instructions to Tenderers documents or any other form approved by the Employer shall be used for Bank Guarantee. The Bank Guarantee shall be valid up to 6 months beyond the Defect Liability Period. In case the contract value exceeds beyond 25% of the original contract value, the contractor shall have to submit additional performance security.

4.2.2. Forfeiture Failure of the successful Tenderer to furnish the required Performance Security shall be a ground for the annulment of the award of Contract and forfeiture of the tender security.

4.2.3. Release The whole of the Performance Security amount shall be liable to be forfeited by the Employer at the discretion of the Employer, in the event of any breach of contract on the part of the Contractor.

i. On completion of the entire work, one half of the Performance Security shall be refunded to the Contractor, on issue of Taking over Certificate by the Engineer, in accordance with Sub-Clause 9.1 and 9.2 of these conditions. This shall not relieve the Contractor from his obligations and liabilities, to make good that may be detected during the Defects Liability Period.

ii. The balance amount shall become due and shall be paid to the on Contractor on signing of the Performance Certificate after the expiry of the final Defects Liability Period as per Clause 10.9 of these conditions.

4.2.4. Guarantees and Warranties

Within 30 days of the date of Notice of Award of the Tender, the Contractor shall submit to the Employer:

a. An Undertaking in the approved format from a parent company,the identity of which shall have been submitted in writing to the Employer prior to acceptance of the Tender and against which the Employer shall have raised no objection.

b. A written Guarantee in the approved format from a parentcompany, the identity of which shall have been submitted in writing to the Employer prior to acceptance of the Tender and against which the Employer shall have raised no objection.

c. A warrantee in the approved format from the Contractor.

In the event that the Contractor shall comprise two or more members, corporations acting in partnership, joint venture, consortium or otherwise each such member or corporation shall submit a parent company Undertaking and Guarantee.

Notwithstanding any other provision of the Contract:

a. submission by the Contractor of the requisite Performancesecurity, parent company Undertakings and written Guarantees shall be condition precedent to the Contractor's entitlement to any payment, under the Contract; and

b. failure by the Contractor to provide a Performance security orparent company Undertakings or parent company Guarantees shall entitle the Employer either to suspend the Works or to terminate the Contract forthwith by notice in writing to that effect, notwithstanding that the Contractor may have been permitted to proceed with the Works, and the Contractor shall not be entitled to any compensation whatsoever as a consequence of such suspension or termination.

4.3. Representation on Works

Unless the Contractor's Representative is named in the Contract, the Contractor shall, within 14 days of Notice to Proceed, submit to the Contract. Whenever the Contractor's Representative is to be absent from the Site, a suitable replacement person shall be appointed, with prior consent of Engineer

Failure on part of the Contractor to comply with these provisions shall constitute a breach of Contract leading to action under Sub-Clause 13.2

The Contractor's Representative may delegate any of his powers, functions and authorities to any competent person, and may at any time revoke any such delegation. Any such delegation or revocation shall be in writing and shall not take effect until the Engineer has given prior consent thereto. The Contractor's Representative and such persons shall be fluent in the language of day to day communication and the Contractor shall be bound by and fully liable for the acts or omissions of the Contractor's Representatives or any of his employees and/or delegates, agents or nominees.

4.4. Facilities for andco-ordination with Others.

The Contractor shall not impede and shall afford all necessary facilities, access and/or services to the Employer, Engineer, Designated Contractors, utility undertakings, other relevant authorities and other contractors (whether employed by the Employer or not) who are carrying out on, or in the vicinity of, the Site, works not included in the Contract but forming part of the Project:

a. The Contractor shall take all reasonable steps to ensure that theWorks are co-ordinated and integrated with the design, manufacture, installation execution and testing of such other works and shall in particular (but without limitation).

i. complies with any direction which the Engineer may give for the integration of the design of the Works with the design of any other part of the Project;

ii. consult, liaise and co-operate with those responsible for carrying out such other works, including where necessary, in the preparation of the respective designs, the preparation of

Engineer for consent the name and particulars of the person the Contractor proposes to appoint. The Contractor shall not revoke the appointment of the Contractor's Representative without the prior consent of the Engineer. The Contractor's Representative so nominated shall have full authority to act on behalf of the Contractor. The Contractor's Representative shall give his whole time to directing the preparation of the Construction and/or Manufacture Documents and the execution of the Works. The Contractor's Representative shall receive (on behalf of the Contractor) all notices, instructions, consents, no objection certificate approvals, certificates, determinations and other communications under the

co-ordinated programmes, method statements, co-ordination drawings and specifications together with arrangements of service priorities and zoning;

iii. participate in Integrated Testing and Commissioning of the system with Designated Contractors and demonstrate to the satisfaction of the Engineer that the Works have been designed and constructed in a manner compatible with the works of Designated Contractors.

b. The Contractor shall undertake design co-ordination with othercontractors who are carrying out works forming part of the Project as described in the Employer's Requirements. At the end of each such co-ordination period, the Contractor and the other contractor with whose works the interface period refers shall jointly state in writing that their design co-ordination activities are complete and that their respective designs are integrated and can be finalised without interference with each other's designs or the designs with which their designs have already been integrated. A copy of this joint written statement shall be provided to the Engineer within 7 days of the end of the said design co-ordination period. Unless and until copies of all relevant and necessary design co-ordination statements have been submitted to the Engineer, the Engineer shall be entitled to suspend any review or further review of the Contractor's or the other contractor's design submissions. Such suspension shall not be grounds for the Contractor to claim nor shall be entitled to receive an extension of time or additional payments.

The Contractor shall provide within the Site, staging, storage and unloading areas for the use of Designated Contractors, if any, who are undertaking track work, fare collection system, supply, testing and commissioning of Rolling Stock, escalators, lifts, signaling and telecommunications and traction power installation works, etc. Separate locations shall be provided for each such contractor. The exact size and location of these staging, storage and unloading areas, and the commencement date shall be coordinated and agreed during the design interface period with each Designated Contractor.

c. Any other contract which depends for its execution on theContract or upon which the Contract is dependent for its own execution shall be identified by the Engineer as a "Designated Contract". The Contractor shall provide attendance on Designated Contractors in accordance with the Employer's Requirements and as instructed by the Engineer. The identity of the contractor for a Designated Contract may not be known before the execution of the Contract but this shall not be a ground for the Contractor to object to the subsequent appointment of a Designated Contractor.

The Contractor shall in accordance with the requirements of the Engineer co-ordinate his own Works with that of Designated Contractors through Co-ordinated Installation Programme (CIP) stated in the Employer's Requirements, or as the Engineer may require, and shall afford the Designated Contractors all reasonable opportunities for carrying out their works.

d. The Contractor shall afford all reasonable opportunities, forcarrying out their work, to other contractors employed by the Employer and their workmen respectively and the workmen of the Employer who may be

engaged on or near the Site of any work, ancillary to the Works, but, not included in the Contract and shall not cause them inconvenience.

e. If the Contractor shall suffer delay by reason of failure by anyDesignated Contractor to meet the specified installation interfacing and co-ordination, completion dates, which delay shall be caused otherwise than by fault of the Contractor, or, if compliance with sub-clause (f) herein shall involve the Contractor in delay beyond that which could be reasonably foreseen by an experienced contractor at the time of tender, then the Engineer shall take such delay into account in determining any extension of time to which the Contractor is entitled under the Contract.

f. It shall be the responsibility of the Contractor to ensure that the full extent of the Works under the Contract and the works to be carried out by Designated Contractors within the Works or, in, on, under, through and over the Site are co-ordinated and integrated in their design, manufacture, installation and construction. Such responsibility shall neither be mitigated nor in any other way affected by virtue of similar responsibilities being placed on other contractors.

The Contractor shall be deemed to have made adequate allowance in the Contract Price and in the Works Programme in respect of these obligations.

If any act or omission of the Contractor whether directly or indirectly results in the delay in the execution of the works of a Designated Contractor, the Contractor, in addition to his liability in respect of liquidated damages if they become due, shall pay to the Employer, or the Engineer may deduct from Interim Payment Certificates such amount as the Engineer shall have certified in respect of additional payments or costs to the Designated Contractor in respect of such delay.

4.5. Sub-contractors

The Contractor shall not sub-contract the whole of the Works.

4.5.1.

4.5.2. Unless otherwise stated in the Special Conditions of Contract:

a. the Contractor shall not be required to obtain consent forpurchases of Materials which are in accordance with the makes specified in the Contract or provisions of labour or for the subcontracts for which the Sub-contractor is named in the Contract;

b. the prior consent of the Engineer shall be obtained for otherproposed Sub-contractors;

c. not less than 28 days before the intended date of each Sub-contractor commencing work, the Contractor shall notify the Engineer of such intention; and the Contractor shall give fair and reasonable opportunity for contractors in India to be appointed as Sub-contractors.

4.5.3. The Contractor shall be responsible for observance by all Subcontractors of all the provisions of the Contract. The Contractor shall be responsible for the acts or defaults of any Sub-contractor, his representatives or employees, as fully as if they were the acts or defaults of the Contractor, his representatives or employees and nothing contained in Sub-clause (a) of clause 4.5 shall constitute a waiver of the Contractor’s obligations under this contract. The Contractor shall provide to

the Engineer of all the Sub Contracts including terms, conditions and pricing. The Contractor shall endeavor to resolve all matters and payments amicable and speedily with the sub-contractors.

4.5.4. The contractor shall ensure that their sub-contractors, material/equipment suppliers, consultants and other agencies deployed by them in connection with execution of the contract do not make any claim or raise any dispute before NMRC. For this, necessary provision is to be made in the agreement between contractor and their subcontractors/consultants/other agencies. Similarly, the agreement should also incorporate the provision of dispute resolution. An undertaking in the following format shall be submitted by contractor in respect of each such agency: -

"Name of work……...

In connection with above work, M/s……, Contractor has/is engaging M/s……., as sub-contractor (or consultant or material/equipment supplier or service provider). For this, the terms and conditions of agreement include necessary provisions for resolution of dispute if any arising between contractor and sub-contractor.

It is confirmed by the sub-contractor that any claim/dispute arising out of the above work shall be resolved in terms of agreement and shall not be raised before NMRC and also shall not make any claim against NMRC before any forum/court.

Signature of Contractor

4.6. Assignment of Contractor's and Sub-contractor's Obligations

The Contractor shall not assign a right or benefit under the Contract without first obtaining Employer's prior written consent, otherwise than by:

a. a charge in favour of the Contractor's bankers of any money dueor to become due under the Contract, or

b. assignment to the Contractor's insurers (in cases where theinsurers have discharged the Contractor's loss or liability) of the Contractor's right to obtain relief against any other party liable.

If a Subcontractor's obligations extend beyond the expiry date of Defects Liability Period then the Contractor shall assign the benefits of such obligations to the Employer. In the event that a sub-contractor of any tier provides to the Contractor or any other sub-contractor a warranty in respect of Plant, Materials or services supplied in connection with the Works, or undertakes a continuing obligation of any nature whatsoever in relation to such Plant, Materials or services (including without limitation an obligation to maintain stocks of spare parts) extending for a period exceeding that of the Defects Liability Period or where there is more than one Defects Liability Period exceeding that of the latest Defects Liability Period, and if the Engineer so directs in writing within 21 days of the expiry of the Defects Liability Period or the latest Defects Liability Period (as the case may be), the Contractor shall immediately assign or obtain the assignment of the benefit of such warranty or obligation to the Employer or at the direction of the Employer, to any third party referred to in Sub-Clause 2.4.

4.7. Compensation for Breach

Any breach of Sub-clauses 4.5 to 4.6 shall entitle the Employer to rescind the contract under Clause 13.2 of these conditions and also render the Contractor liable for loss or damage arising due to such cancellation.

4.8. Setting Out

4.8.1. Accurate Setting Out

The Contractor shall be responsible for

a. the accurate setting out of the Works in relation to the originalpoints, lines and levels of reference given by the Engineer in writing

b. the correctness of position, levels, dimensions and alignments ofall parts of the Works

c. the provisions of all necessary instruments, equipment,apparatus and labour in connection with the foregoing responsibilities

d. Carefully protecting and preserving all bench marks, sight rails,pegs and other things used in setting out the Works

The checking of any setting-out or of any line or level by the Engineer shall not in any way relieve the Contractor of his responsibility for the accuracy or correctness thereof and the Contractor shall carefully protect and preserve all bench-marks, sight-rails, pegs and other things used in setting out the Works.

4.8.2. Errors in Setting out

If at any time during the execution of the Work, an error appears in the positions, levels, dimensions or alignment of any part of the Works, the Contractor on being required to do so by the Engineer shall, at Contractor's cost, rectify such error to the satisfaction of the Engineer.

4.9. Site Data

The Employer shall have made available to the Contractor with the Tender documents such relevant data in Employer's possession on hydrological and sub-surface conditions. The accuracy or reliability of the data/studies/reports and of any other information supplied at any time by the Employer or Engineer is not warranted with respect to the viability of his design and execution of Works and the Contractor shall be responsible for interpreting all such data. The Contractor shall conduct further investigations considered necessary by him at his own cost and any error, discrepancies if found in Employer's data at any stage will not constitute ground for any claim for extra time and costs.

The Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Tender or Works.

The Contractor shall also be deemed to have inspected and examined the Site, its surroundings, the above data and other available information with respect to the viability of his design and execution of Works and to have satisfied himself before submitting the Tender, as to all the relevant matters including without limitation:

a. the form and nature of the Site, including the sub-surfaceconditions;
b. the hydrological and climatic conditions;
c. the extent and nature of the work, Plant, and Materials necessaryfor the execution and completion of the Works and the remedying of any defects;
d. the applicable laws, procedures and labour practices
e. The Contractor's requirement for access, accommodation,facilities, personnel, power, transport and other services.
f. the risk of injury or damage to property adjacent to the Site and to the occupiers of such property or any other risk.

4.10. Sufficiency of accepted Contract Amount

The Contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Contract Price. Unless otherwise stated in the Contract, the Contract Price shall cover all his obligations under the Contract and all things necessary for the proper design, execution and completion of the Works, testing and commissioning (including Integrated Testing and Commissioning) and remedying of any defects.

4.11. Access Route

The Contractor shall be deemed to have satisfied himself as to the suitability and availability of the access routes he chooses to use. The Contractor shall (as between the parties) be responsible for the maintenance of access routes. The Contractor shall provide at his cost signs or directions, which he may consider necessary or as instructed by Engineer for the guidance of his staff, labour and others. The Contractor shall obtain any permission concessions and related easement right that

4.12. Rights of way and Facilities

may be required from the relevant authorities for the use of such routes, signs and directions.

The Employer will not be responsible for any claims which may arise from the use or otherwise of any access route. The Employer does not guarantee the suitability or availability of any particular access route and will not entertain any claim for any non-suitability or non-availability for continuous use during construction of any such route.

The Employer will acquire and provide land for Permanent Works and right of way (within NMRC's land) for access thereto over routes

established by the Contractor. The Contractor shall bear all cost and charges for special or temporary rights of way which he may require including those for access to the Site. The Contractor shall also obtain, at his risk and cost, any additional facility outside the Site which he may require for the purpose of the Works the Employer reserves the right to make use of these service roads/rights of way for itself or for other Contractors working in the area, as and when necessary without any payment to the Contractor.

4.13. Programmes The Contractor shall submit a detailed programme to the Engineer after receipt of the Notice of Award not later than 28 days from the date of receipt of Notice of Award. The Contractor shall also submit a revised programme whenever the Engineer finds that the previous programme is inconsistent with actual progress or with the Contractor's obligations.

Each programme shall include the following:

a. the order in which the Contractor proposes to carry out the Works(including each stage of design, procurement, manufacture, delivery to Site, construction, erection, testing and commissioning),

b. all major events and activities in the production of Constructionor Manufacture Documents; and

c. the sequence of all tests specified in the Contract includingIntegrated Testing and Commissioning.

Unless otherwise stated in the Contract, the programmes shall be developed using precedence networking techniques, showing early start, late start, early finish and late finish dates.

No significant alteration to the programmes, or to such arrangements and methods, shall be made without obtaining consent of the Engineer. If the progress of the Works does not conform to the programmes, the Engineer may instruct the Contractor to revise the programmes, showing the modifications necessary to achieve completion within the Time for Completion.

Consent by the Engineer to Programmes shall not relieve the Contractor of any of his responsibilities or obligations under the Contract. If the Programmes indicate that a Key Date has not, or will not be met, it shall not, by itself entitle the Contractor to an extension of time in relation to such Key Date.

4.14. Progress Reports The Contractor shall submit to the Engineer by the end of each calendar month his Monthly Progress Report which shall, amongst other things, highlight actual or potential departures from the Works Programmes and/or the Design Submission Programme and state the measures which the Contractor proposes to take in order to make good or reduce any delay.

If requested by the Engineer, the Contractor shall submit to the Engineer, at weekly intervals, a written report as to the progress of off-Site manufacture of Plant, Rolling Stock and Materials.

The Contractor shall also submit to the Engineer such other reports as may reasonably be required by him or any relevant authority or public body.

4.15. Contractor's Equipment

4.15.1. All Contractor's Equipment and Temporary Works provided by the Contractor shall, when brought on to the site, be deemed to be exclusively intended for execution of the Works and not be removed without the consent in writing of the Engineer. Such consent shall not be unreasonably withheld or delayed.

4.15.2. Upon completion of the Works the Contractor shall remove from the Site all the said Constructional Plant and his unused materials.

4.15.3. The Employer shall not, at any time, be liable for the loss or damage to any of the Constructional Plant, Temporary Works or materials save as mentioned in Clauses 14.1

4.15.4. In respect of any Constructional Plant which the Contractor shall have imported for the purpose of the Works, the Employer may assist the Contractor, where required, in procuring any necessary Government consent for re-export of the same after the completion of the Works.

4.15.5. The Employer may assist (but is not obligated to) the Contractor, where required, in obtaining clearance through the Customs of Constructional Plant, materials and other things required for the Works.

4.16. Safety of Works

The Contractor shall throughout the execution of the Works including the carrying out of any testing, commissioning (including Integrated Testing and Commissioning), or remedying of any defect:

a. take full responsibility for the adequacy, stability, safety andsecurity of the Works, Plant, Rolling Stock, Contractor's Equipment, Temporary Works, operations on Site and methods of manufacture, installation, construction and transportation;

b. have full regard for the safety of all persons on or in the vicinityof the Site (including without limitation persons to whom access to the Site has been allowed by the Contractor), comply with all relevant safety regulations, including provision of safety gear, and insofar as the Contractor is in occupation or otherwise is using areas of the Site, keep the Site and the Works (so far as the same are not completed and occupied by the Employer) in an orderly state appropriate to the avoidance of injury to all persons and shall keep the Employer indemnified against all injuries to such persons.

c. provide and maintain all lights, guards, fences and warning signsand watchmen when and where necessary or required by the Engineer or by laws or by any relevant authority for the protection of the Works and for the safety and convenience of the public and all persons on or in the vicinity of the Site; and

where any work would otherwise be carried out in darkness, ensure that all parts of the Site where work is being carried out are so lighted as to ensure the safety of all persons on or in the vicinity of the Site and of such work.

Contractor is required to take note of all the necessary provisions in Employer's Safety, Health and Environment Manual (SHE Manual) and the Contractor's price shall be inclusive of all the necessary costs to meet the prescribed safety

standards. In the case, the Contractor fails in the above, the Employer may provide the necessary arrangements and recover the costs from the Contractor.

4.17. Protection of the Environment

The Contractor shall take all reasonable steps to protect the environment (both on and off the Site) and to avoid injury, damage and nuisance to people and property resulting from pollution, noise and other results of his operations. The Contractor shall ensure that air emissions, surface discharges and effluent from the Site during the Contract Period shall not exceed the values indicated in the Employer's Requirements and shall not exceed the values prescribed by law. The Contractor shall conform to the Employer's Requirements and shall indemnify the Employer against any liability or damages or claims arising out of his operations. The Contractor shall be responsible and liable for any stoppage, closure or suspension of the works due to any contravention of statutory requirements relating to the protection of the environment and shall indemnify and keep indemnified the Employer in this regard.

The Contractor's Site Environmental Plan shall be developed from his Employer's Safety. Health and Environmental Manual (SHE Manual), as per the Employer's Requirements and Special Conditions of Contract. Nothing extra shall be payable to the Contractor on this account and his Tender price shall be inclusive of expenditure required to be incurred for working as per SHE Manual.

4.18. Electricity Water and Gas

The Contractor shall be responsible for making his own arrangements at his own cost to obtain supply of water, electricity or gas for the Works. The Employer where feasible may at its discretion assist the Contractor in this respect.

4.19. Tools, Plants And Equipment Supplied By The Employer

Except for any specific item mentioned in the Special Conditions of Contract or in Employer's Requirements, the Contractor shall provide all tools, plants and equipment for the Works. In respect of such exceptional tools, plants or equipment committed to be provided by the Employer under terms and conditions specified in the Special Conditions of Contract, the Contractor shall take all reasonable care and shall be responsible for all damages or loss caused by him, his representatives, sub-contractors or his workmen or others while they are in his charge.

On completion of the Works, the Contractor shall hand over the unused balance of the tools, plants and equipment to the Employer in good order and repair, fair wear and tear expected, and shall be responsible for any failure to account for the same or any damage done thereto.

The decision of the Engineer as to the amount recoverable from the Contractor on this account shall be final and binding.

4.20. Employer's Materials & Excavated Materials

i. Except for items mentioned in the Special Conditions of Contract, the Contractor shall provide all materials for the Works. Material if any, to be provided by Employer will be done only in a phased manner as per pre-approved program, against a Bank Guarantee for the value of the Material and at terms and conditions for issue, upkeep, usage, return and recovery of such Materials as specified in Special Conditions of Contract.

ii. Unless otherwise specified, the Contractor shall not sell or remove, except for the purpose of this Contract, sand, stone, clay, ballast, earth, rock or other materials obtained from the work Site and these shall be the property of the Employer and will be disposed off only in the manner instructed by him.

4.21. Sheds, Stores, Yards

It shall be the responsibility of the Contractor to provide at his own expense the required sheds, store houses, and yards for both Permanent and Temporary Works and provide free access to the Engineer and the Engineer's Representative who will have right of inspection including that of instructing the Contractor to remove a particular material from the stores and not to use the same on the Works.

4.22. Temporary Works

All temporary works necessary for the proper execution of the works shall be provided and maintained by the Contractor at his cost and subject to the consent of the Engineer shall be removed by Contractor at his own expense when they are no longer required and in such manner as the Engineer shall direct. In case the Contractor fails to remove the temporary works on completion the Engineer is authorized to get the same removed and recover the cost there of from the Contractor.

4.23. Unforeseeable Physical Conditions

In this Clause "physical conditions" means natural physical conditions, which the Contractor encounters at Site while executing the Works excluding climatic conditions.

If, during the execution of the Works, the Contractor shall encounter physical conditions, which, in his opinion, could not have been reasonably foreseen by an experienced Contractor, the Contractor shall forthwith give written notice thereof to the Engineer and if, in the opinion of the Engineer, such conditions could not have been reasonably foreseen by an experienced Contractor, then the Engineer shall certify and the Employer shall pay reasonable additional cost to which the Contractor shall have been put by reason of such conditions in the following cases:

a. for complying with any instruction which the Engineer may issueto the Contractor in connection therewith, and

b. for any proper and reasonable measures approved by theEngineer which the Contractor may take in the absence of specific instructions from the Engineer, as a result of such conditions or obstructions being encountered.

The decision of the Engineer as to the additional cost shall be final and binding.

4.24. Access for Engineer

The Contractor shall allow the Engineer or the Engineer's Representative or any other person authorised by him, at all times access to the Site, and to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured, fabricated and/or assembled for the Works. The Contractor shall ensure that sub contracts if any shall contain provisions entitling the Engineer or any person authorised by him to have such access.

4.25. Access Road and Way Leaves

Providing access roads/ way leaves to the site will be Contractor's responsibility.

4.26. Contractor to keep Site Clear

During the execution of the Works, the Contractor shall keep the Site free from all unnecessary obstruction, and shall store or dispose of any Contractor's Equipment or surplus materials. The Contractor shall clear away and remove from the Site any wreckage, rubbish or Temporary Works no longer required.
On completion of the works, the Contractor shall clear away and remove from site all Constructional Plant, surplus material and Temporary Works. He should leave the whole of the site and Works in a clean, tidy and workman like condition to the satisfaction of the Engineer.

On completion of Work the Contractor shall also clear away the labour camps, hutments and other related installations and restore the land to its original condition to the satisfaction of the Engineer within 45 days of the physical completion of Work. The cost on account of delay in return of land and reinstatement of original condition within the stipulated time as determined by Engineer will be recovered from the Contractor's dues.

No final payment in settlement of the accounts for Works shall be made or held to be due to the Contractor, till, in addition to any other condition necessary for such final payment, site clearance and clearances of labour camps etc. shall have been effected by him. Such clearance may be made by the Engineer through any other agency at the expense of the Contractor in the event of the Contractor's failure to comply with this provision within 7 days after receiving notice to that effect from the Engineer. All expenses on such removal / clearance shall be debitable to the Contractor as loans due from the Contractor to the Employer, and the Employer shall be competent to recover the same from Contractor's onaccount or final bills, or from Performance Security amount or from any other amount payable to the Contractor in any other Contract.

4.27. Security of the Site

The Contractor shall be wholly responsible for security of site and Works.
Unless otherwise stated in Special Conditions of Contract

a. the Contractor shall be responsible for keeping unauthorisedpersons off the Site; and

b. Authorized persons shall be limited to the Employees of theContractor, Subcontractor or persons authorized by the Engineer.

4.28. Contractor's Operations on Site

The Contractor shall confine his operations to the Site, and to any additional area which may be provided to the Contractor and agreed by the Engineer as working areas. The Contractor shall take all necessary precautions to keep his personnel and equipment within the Site and such additional areas, and to keep and prohibit them from encroaching on adjacent land.

4.29. Discoveries

All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest, in addition to oil and other minerals discovered on the Site shall be the absolute property of the Government of India and the Contractor shall take all the necessary precautions to prevent its workmen or its sub-contractors' workmen or any other person from removing or damaging any such article or thing and shall immediately upon discovery thereof, acquaint the Engineer of such discovery and carry out the instructions of the
Engineer

4.30. Publicity

The Contractor shall not publish or otherwise circulate alone or in conjunction with any other person, any articles, photographs or other materials relating to the Contract, the Site, the Works, the Project or any part thereof, nor impart to the Press, or any radio or television network any information relating thereto, nor allow any representative of the media access to the Site, Contractor's Works Areas, or off-Site place of manufacture, or storage except with the permission, in writing, of the Employer. The Contractor shall ensure that his sub-contractors of any tier shall be bound by a like obligation and shall, if so required by the Employer, enforce the same at his own expense. The provisions of this Sub-Clause shall not exempt the Contractor from complying with any statutory provision in regard to the taking and publication of photographs.

4.31. Disclosure Of Relationship

If the Contractor or any partner of the Contractor or Director of the Contractor's company is closely related to any of the Officers of the Employer or the Engineer, or alternatively, if any close relative of an officer of the Employer or the Engineer has financial interest / stake in the Contractor's firm, the same shall be disclosed by the Contractor at the time of filing his tender. Any failure to disclose the interest involved, shall entitle the Employer to rescind the Contract, without payment of any compensation to the Contractor. The Contractor shall note that he is prohibited from developing such interest during the Contract period.

4.32. Use Of Explosives prior Approval of the Engineer

Explosives if required on the Work shall be used by Contractor only with and in the manner and to the extent permitted by him. The Contractor shall be responsible for safe upkeep of such explosives in a special magazine as per the law on explosives as well as for taking all the precautions in the usage of the explosives with proper license and at Contractor's cost, sole risk and responsibility. The Contractor shall hold the Employer harmless and indemnify for the above.

4.33. Corrupt or fraudulent practices

4.33.1. Definition The Employer requires that the Bidders/Contractors, their designated contractors and/or their agents observe the highest standards of ethics during Tendering and execution of this Contract. In pursuance with this policy, the Employer:

a. defines, for the purpose of these provisions, the terms set forthbelow as follows:
   i. "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to Employer, Engineer or any of their employees, influence in the procurement process or in Contract execution; and
   ii. "fraudulent practice" means a concealment or misrepresentation of facts in order to influence a procurement process or the execution of a Contract to the detriment of the Employer and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial noncompetitive levels and to deprive the Employer of the benefits of free and open competition.
   iii. Breach of any of the contract condition during execution.

b. Will reject the Tender for the Work or rescind the Contract if theEmployer determines that the Bidder/Contractor has engaged in corrupt or fraudulent practices.

c. Will declare a Contractor ineligible, either indefinitely or for astated period of time, to be awarded a Contract/s if he at any time determines that the Contractor has engaged in corrupt or fraudulent practices in competing for, or in executing the Contract.

d. The successful Bidders/Contractors shall apprise through ChiefVigilance Officer, NMRC of any fraud/suspected fraud as soon as it comes to their notice.

4.33.2. Compensation In the event of rescission of Contract under Sub-clause 4.33.1, the to Contractor on Contractor shall not be entitled to any compensation whatsoever, except rescission of Contract for the work done up to the date of rescission.

5. Design

The clauses under the head 'Design' are applicable only in 'Design & Build' contracts and in case of 'Part Design & Build' contracts, these are applicable only to part of the contract in which the design is the responsibility of the contractor.

5.1. General Obligations

The Contractor shall design and provide all necessary specifications for the Works in accordance with the site plans and Employer's requirements. Any design detail, plan, drawing, specifications, notes, annotations, and information required shall be provided in such sufficient format, details, extent, size and scale and within such time as may be required to ensure effective execution of Works and/or as otherwise required by the Engineer.

The Contractor holds himself, and his designers as having the experience and capability necessary for the design. The Contractor undertakes that the designers shall be available to attend discussions with the Engineer at all reasonable times during the Contract Period.

The designer shall be the same entity as proposed by the Contractor at the time of pre-qualification, unless otherwise approved by the Employer. The Contractor shall furnish Designer's Warranty in the format approved by the Employer.

5.2. Contractor's warranty of design

a. The Contractor shall be fully responsible, for the suitability, adequacy, integrity, durability and practicality of the Contractor's proposal.

b. The Contractor warrants that the Contractor's Proposals meetthe Employer's Requirements and is fit for the purpose thereof. Where there is any inadequacy, insufficiency, impracticality or unsuitability in or of the Employer's Requirements or any part thereof, the Contractor's Proposal shall take into account, address or rectify such inadequacy, insufficiency, impracticality or unsuitability at Contractor's own cost.

c. The Contractor warrants that the Works have been or will bedesigned, manufactured, installed and otherwise constructed and to the highest standards available using proven up-to-date good practice

d. The Contractor warrants that the Works will, when completed,comply with enactments and regulations relevant to the Works

e. The Contractor warrants that the design of the Works and themanufacture of plant have taken or will have taken full account of the effects of the intended manufacturing and installation methods, Temporary Works and Contractor's Equipment

f. The Contractor shall also provide a guarantee from the Designer for the design for suitability, adequacy, practicality of design for Employer's Requirements

g. The Contractor shall indemnify the Employer against anydamage, expense, liability, loss or claim, which the Employer might incur, sustain or be subject to arising from any breach of the Contractor's design responsibility and/or warranty set out in this Clause.

h. The Contractor further specifies and is deemed to have checkedand accepted full responsibility 'for the Contractor' s Proposal and warrants absolutely that the same meets the Employer's Requirements:

i. Notwithstanding that such design may be or have been prepared, developed or issued by the Employer, any of Contractor's consultants, his sub-contractors and/or his qualified personnel/persons or cause to be prepared, developed or issued by others.

ii. Notwithstanding any warranties, guaranties and/or indemnities that may be or may have been submitted by any other person. iii. Notwithstanding that the same have been accepted by the Engineer

The Contractor shall be fully responsible for the Plants, Materials, goods, workmanship, preparing, developing and coordinating all design Works to enable that part of the Works to be constructed and/or to be fully operational in accordance with the Contract's requirements.

Apart from the Contractor, the above warranty shall also be applicable for his designer. This warranty shall be a part of his sub contract with the designer and should be made available at the time of signing of the Agreement.

No claim for additional payment or extension of time shall be entertained and/or the Contractor shall not be relieved from any obligation/liability under the Contract, for any delay, suspension, impediment to or adverse effect upon the progress of the Works due to any mistake, inaccuracy, discrepancy or omission

in or between the Contractor's, the Definitive Design and the final design, or any failure by the Contractor to prepare any Design Data or submit the same to the Engineer in due time and the Contractor shall promptly make good any such defect at his own cost.

5.3. Construction and/or Manufacture Documents

The Manufacture Documents shall comprise the technical documents specified in the Employer's Requirements, documents required to satisfy all regulatory approvals, documents described in Sub Clause 5.6 (As Built Document), and Sub Clause 5.7 (Operations and Maintenance Manuals). The Contractor shall prepare all Manufacture Documents in sufficient detail and shall also prepare any other document necessary to instruct the Contractor's personnel. The Engineer shall have the right to inspect the preparation of all these documents wherever they are being prepared.

Each of the Construction and/or Manufacture Documents shall, when considered ready for use, be submitted to the Engineer for preconstruction or pre-manufacture review. Unless otherwise stated in Employer's Requirements, each review by the Engineer shall not exceed 21 days, calculated from the date on which the Engineer receives the Manufacture Document.

The Engineer may during the review period, give notice to the Contractor that a Manufacture Document fails (to the extent stated) to comply with the Employer's Requirements, it shall be rectified, resubmitted and reviewed (and if specified, approved) in accordance with this SubClause, at the Contractor's cost.

For each part of the Works, and except to the extent that the prior consent of the Engineer shall have been obtained:

a. In the case of a Construction and/or Manufacture Documentwhich has (as specified) been submitted for the Engineer's approval
   i. The Engineer shall give notice to the Contractor that the Construction and/or Manufacture Document is provided with no objection, with or without comments, or that it fails (to the extent stated) to comply with the Contract
   ii. Execution of such part of the Works shall not commence until the Engineer has provided with no objection the Construction and/or Manufacture

   Document; and iii. The Engineer shall be deemed to have provided with no objection the Construction and/or Manufacture Document upon the expiry of the review periods for all the Construction and/or Manufacture Documents which are relevant to the design and execution of such parts, unless the Engineer has previously notified otherwise in accordance with sub-paragraph (i)

b. Construction and/or manufacture of such part of the Works shallnot commence prior to the expiry of the review of the Construction and/or Manufacture Documents which are relevant to its design and execution;

c. Construction and/or manufacture shall be in accordance withsuch reviewed (and if specified, approved) Construction and/or Manufacture Documents; and

d. If the Contractor wishes to modify any design or documentwhich has previously been submitted for such pre-construction and/or pre-manufacture review, the Contractor shall immediately notify the Engineer, and based on Engineer's approval shall subsequently submit

revised documents to the Engineer in accordance with the above procedure.

If the Engineer instructs that further Construction and/or Manufacture Documents are necessary for carrying out the Works, the Contractor shall promptly and at Contractor's cost prepare such documents,

Errors omissions, ambiguities, inconsistencies, inadequacies and other defects if found at any stage in construction or any operations manufacture documents, then shall be rectified by the Contractor at his own cost and any approval or consent or review (under this sub-clause or otherwise) by the Employer/Engineer of the Manufacture and Construction Documents under this Sub-clause shall not relieve the Contractor from any obligations or responsibility under the Contract.

5.4. Technical and Standards Regulations

The design, the Construction and/or Manufacture Documents, the execution and the completed Works (including remedying of defects therein) shall comply with the specifications, technical standards, building construction, safety and environmental regulations and other standards specified in the Employer's Requirements applicable to the
Works or defined by the applicable laws and regulations

5.5. Samples

The Contractor shall submit at his own cost the following samples and relevant information to the Engineer for pre-construction and/or premanufacture review in accordance with the procedure for Construction and/or Manufacture Documents described in Sub-Clause 5.3:

a. manufacturer's standard samples of Materials,

b. samples (if any) specified in the Employer's Requirements.

Each sample shall be labelled as to origin and intended use in the Works.

5.6. As-Built Drawings and Documents

This clause is applicable for 'Build' part of contract also. The Contractor shall prepare, and keep up-to-date, a complete set of "as-built" records of the execution of the Works, showing the exact "as-built" locations, sizes and details of the Works as executed, with cross references to relevant specifications and data sheets. These records shall be kept on the Site and shall be used exclusively for the purposes of this SubClause. Six copies shall be submitted to the Engineer prior to the commencement of the Tests on Completion.

In addition, the Contractor shall prepare and submit to the Engineer "asbuilt drawings" of the Works, showing all Works as executed. The drawings shall be prepared as the Works proceed and shall be submitted to the Engineer for his inspection. The Contractor shall obtain the consent of the Engineer as to their size, the referencing system, and other pertinent details.

Prior to the issue of any Taking Over Certificate, the Contractor shall submit to the Engineer one microfiche copy, one full-size original copy and six printed copies of the relevant "as-built drawings", and any further Construction and/or Manufacture Documents specified in the Employer's Requirements. The Works shall not be considered to be completed for the purposes of Taking Over under Sub-Clause 9.1 until such documents have been submitted to the Engineer.

5.7. Operation and Maintenance Manuals

Prior to commencement of the Tests on Completion, the Contractor shall prepare, and submit to the Engineer, Operation and Maintenance Manuals in accordance with the Employer's Requirements and in sufficient detail for the Employer to operate, maintain, dismantle, reassemble, adjust and repair the Works. The Works shall not be considered to be completed for the purposes of Taking Over under SubClause 9.1 until such Operation and Maintenance Manuals have been submitted to the Engineer and received his consent.

5.8. Intellectual Property Rights and Royalties

The Contractor shall indemnify the Employer and the Engineer from and against all claims and proceedings on account of infringement (or alleged infringement) of any patent rights, registered designs, copyright, design, trademark, trade name, know-how or other intellectual property rights in respect of the Works, Contractor's Equipment, machines, work method, or Plant, or Materials, or anything whatsoever required for the Works and from and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. The Contractor shall pay all traffic surcharges and other royalties, licence fees, rent and other payments or compensation, if any, for getting stone, sand, gravel, clay or other materials, machine, process, systems, work methods, or Contractor’s Equipment required for the Works. The Contractor shall, in the event of infringement of Intellectual Property Rights, rectify, modify or replace at his own cost the Works, Plant or materials or anything whatsoever required for the Works so that infringement no more exist or in the alternative shall procure necessary rights/license so that there is no infringement of Intellectual Property Rights.

The Contractor shall be promptly notified of any claim under this SubClause made against the Employer. The Contractor shall, at his cost, conduct negotiations for the settlement of such claim, and any litigation or arbitration that may arise from it. The Employer or the Engineer shall not make any admission which might be prejudicial to the Contractor, unless the Contractor has failed to take over the conduct of the negotiations, litigation or arbitration within a reasonable time after having been so requested. In the event of Contractor failing to act at Engineer’s notice, the Employer shall be at full liberty to deduct any such amount of pending claim from any amount due to the Contractor under this Contract or any other Contract.

Insofar as the patent, copyright or other intellectual property rights in any Plant, Design Data, plans, calculations, drawings, documents, Materials, know-how and information relating to the Works shall be vested in the Contractor, the Contractor shall grant to the Employer, his successors and assignees a royalty-free, non-exclusive and irrevocable licence (carrying the right to grant sub-licences) to use and reproduce any of the works, designs or inventions incorporated and referred to in such Plant, documents or Materials and any such know-how and information for all purposes relating to the Works (including without limitation the design, manufacture, installation, reconstruction, Testing, commissioning, completion, reinstatement, extension, repair and operation of the Works).

If any patent, registered design or software is developed by the Contractor specifically for the Works, the title thereto shall vest in the Employer and the Contractor shall grant to the Employer a non-exclusive irrevocable and royalty-free licence (carrying the right to grant sublicense) to use, repair, copy, modify, enhance, adapt and translate in any form such Software for his own use.

If the Contractor uses proprietary software for the purpose of storing or utilising records the Contractor shall obtain at his own expense the grant of a licence or sub-licence to use such software in favour of the Employer and shall pay such licence fee or other payment as the grantor of such licence may require provided that the use of such software under the licence may be restricted to use relating to the design, construction, reconstruction, manufacture, completion, reinstatement, extension, repair and operation of the Works or any part thereof.

The Contractor's permission referred to above shall be given, inter alia, to enable the Employer to disclose (under conditions of confidentiality satisfactory to the Contractor) programmes and documentation for a third party to undertake the performance of services for the Employer in respect of such programmes and documentation.

If any software is developed under the Contract or used by the Contractor for the purposes of storing or utilising records over which the Contractor or a third party holds title or other rights, the Contractor shall permit or obtain for the Employer (as the case may require) the right to use and apply that Software free of additional charge (together with any modifications, improvements and developments thereof) for the purpose of the design, manufacture, installation, reconstruction, testing, commissioning, completion, reinstatement, extension, repair, modification or operation of the Works, or any part thereof, or for the purpose of any Dispute.

The Employer reserves the right to use other Software on or in connection with the Works.

6. Staff and Labour

6.1. Engagement of

6.2. Rates of Wages and Conditions of Labour

6.3. Persons in the service/ retired of Employer/ Engineer

the work is carried out.

The Contractor shall make himself aware of all labour regulations and their impact on the cost and build up the same in the Contract Price. During the Contract Period no extra amount in this regard shall be payable to the Contractor, for whatsoever reason including any revision of rates payable to the labour due to revision of rates payable in Minimum Wages Act.

Labour provided by the Contractor, either directly or through subcontractors, for the exclusive use of the

Staff and Labour

The Contractor shall make his own arrangements for the engagement of staff and labour at his own cost.

Full compliance of statutory requirements apart, the Contractor shall pay rates of wages and observe conditions of labour not less favourable than those established for the trade or the industry where

Employer or the Engineer, shall, for the purpose of this Sub-Clause, be deemed to be employed by the Contractor.

In the event of default being made in the payment of any money in respect of wages of any person employed by the Contractor or any of its sub-contractors of any tier in and for carrying out of this Contract and if a claim therefor is filed in the office of the Labour Authorities and proof thereof is furnished to the satisfaction of the Labour Authorities, the Employer may, failing payment of the said money by the Contractor, make payment of such claim on behalf of the Contractor to the said Labour Authorities and any sums so paid shall be recoverable by the Employer from the Contractor.

a. The Contractor shall not recruit or attempt to recruit, staff andlabour from amongst the Employer and the Engineer’s personnel.

b. The Contractor either at the tendering stage or duringconstruction stage will not employ any retired employee of Employer or Engineer of the Employer in any capacity unless such employee has completed at least two years post retirement period or has obtained the no-objection certificate from Employer for being employed with the Contractor. It will be responsibility of the Contractor to collect the Employer’s no objection certification

from such retired employee and submit the same back to the Employer.

In case of non-compliance of above, in addition to any or several of the courses, referred in Sub-clauses 13.2 being adopted by the Employer the Contractor on Termination of the Contract for the aforesaid reasons will have no claim whatsoever against the Employer except for actual value of the Work executed till the time of Termination.

6.4. Labour Laws a. In dealing with labour and employees, the Contractor and his Sub-Contractors (including piece rate and petty Contractors) shall comply fully with all laws and statutory regulations pertaining to engagement, payment and upkeep of the labour in India.

b. The Contractor shall have a Labour Welfare Organisationwhich shall be responsible for labour welfare and compliance with prevalent labour laws, statutes and guidelines. In this context the Contractor is also required to familiarize himself with NMRC's Labour Welfare Fund Rules as specified in Special Conditions of Contract or elsewhere in the contract and comply with the same.

c. The Contractor shall prepare and submit compliance reportsof adherence to labour laws as and when desired by the Engineer.

d. The Contractor will ensure to open bank accounts for eachworker employed by him and his subcontractors and all the payments to workers will be released through bank accounts.

e. The violation of Labour Laws viz. Contract Labour(Regulation and Abolition) Act, 1970 & Central Rules, 1971 made there under or other applicable Labour Laws under the jurisdiction shall attract following penalties in addition to the penalties imposed by Statutory Authorities in terms of applicable Act/ Rules:

a)	Delay in payment of dues to any workmen	:	INR 100 per day per workman
b)	Non-compliance of any other provision of labour laws, pointed out by Employer/Engineer or their representative	:	INR 500 for each non compliance informed in writing under the contract

The decision of Engineer with regard to the merits of imposition of penalty, determination of non-compliance and amount of penalty shall be final and binding on Contractor. The 'Contract' under this sub-clause shall include any workmen employed by contractor working within premises of Work at Employer's establishment whether directly or through Sub-Contractor etc.

f. The contractor shall ensure the registration of all his eligible workers (inclusive of sub-contractors and petty contractors) with BOCW Board.

6.5. Working Hours The Contractor, if required, shall carry out work during night hours or in shifts, unless specifically provided otherwise in the Contract. No increase in rates or extra payments shall be admissible for night work.

The Contractor shall provide adequate lighting and safety arrangements.

6.6. Facilities for Staff and Labour

The Contractor shall provide and maintain at his own expense, all necessary accommodation and welfare facilities as per prevailing labour & welfare laws for his (and his Sub- contractor's) staff and labour. This includes good practices like provision of temporary crèche (Bal Mandir) where 50 or more women are employed at a time. All accommodation shall be maintained in a clean and sanitary condition, by the Contractor at his cost.

6.7. Health and Safety

Precaution shall be taken by the Contractor to ensure the health and safety of his staff and labour. The Contractor shall, in collaboration with and to the requirements of the local health authorities, ensure that medical staff, first aid facilities, sick bay and ambulance service are available at the accommodation and on the Site at all times, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as per the Engineer's requirement and will ensure complete compliance with relevant clauses of Employer's Health, Safety and Environment Manual (SHE Manual).

The Contractor's Site Safety Plan shall be developed from his Outline Safety Plan as per Employer's Requirements and SHE Manual of the Employer.

The Contractor shall appoint a member of his staff at the Site to be responsible for maintaining the safety, and protection against accidents, of personnel on the Site. This person shall be qualified for his work and shall have the authority to issue instructions and take protective measures to prevent accidents.

6.8. Contractor's Superintendence

The Contractor shall provide all necessary superintendence during the design and execution of the Works, and as long thereafter as the Engineer may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. Such superintendence shall be provided by sufficient persons having adequate knowledge of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents) for the satisfactory and safe execution of the Works

6.9. Provision Of Efficient And Competent Staff

The Contractor shall employ (or cause to be employed) only persons who are careful and appropriately qualified, skilled and experienced in their respective trades or occupations. The Engineer may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative, who in the opinion of the Engineer:

a. persists in any misconduct,

b. is incompetent or negligent in the performance of his duties,

c. fails to conform with any provisions of the Contract, orpersists in any conduct which is prejudicial to safety, health, or the protection of the environment.

6.10. Preservation of Peace and orderly conduct

6.10.1. The Contractor shall be responsible for preservation of peace and orderly conduct at the site and its neighbourhood by Contractor's employees, Representatives, petty contractors, Sub Contractors etc. In case, deployment of a Special Police Force, becomes necessary at or near Site, during the tenure of Works, the expenses for the same shall be borne by the Contractor.

6.10.2. The Contractor shall at all times take all reasonable precautions which will include that no labour or employee is permitted to work at site in an intoxicated state or under influence of drugs, to prevent any unlawful, riotous or disorderly conduct by or amongst his staff and labour, and to preserve peace and protection of persons and property in the neighbourhood of the Works against such conduct.

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6.11. Labour to Contractor's Employee

If, the Contractor directly or through petty contractors or SubContractors supplies any labour to be used wholly or partly under the direct orders and control of the Engineer or the Employer, whether in connection with any work being executed by the Contractor or otherwise for the purposes of the Employer, such labour shall, for the purpose of this clause, be deemed to be persons employed by the Contractor.

6.12. Report Of Accidents Labour To

The Contractor shall be responsible for safety of all employees, employed by him on Works, directly or through petty contractors or Sub-Contractors, and shall report accidents to any of them, however, and wherever occurring on Works, to the Engineer or the Engineer's Representative, and shall make every arrangement to render all possible assistance and to provide prompt and proper medical attention. The compensation for affected Workers or their relatives shall be paid by the Contractor in such cases with utmost expeditious in accordance with the Workmen's Compensation Act.

6.13. Claim` on account of violation of Labour laws	The Contractor shall be solely accountable for violation of any labour law by it, its petty contractors or Sub Contractors and will pay any such claim/damage to the authorities forthwith on demand. If any moneys shall, as a result of any instructions, directions or decisions from the Authorities or claim or application made under any of the labour laws or regulations, be directed to be paid by the Employer, such moneys shall be deemed to be moneys payable to the Employer by the Contractor and he will pay the same to the Employer forthwith on demand, without demur and without asking for any reasons/explanations from the Employer. On failure of the Contractor to repay the Employer any moneys paid or to be paid by it as aforesaid within seven days after the same shall have been demanded, the Employer shall be entitled to recover the amount from any moneys due or accruing to the Contractor under this or any other Contract with the Employer.

7. Quality Control

7.1. Manner of Execution

All Plant, goods, and Materials to be supplied shall be manufactured, and all work to be done shall be executed, in the manner set out in the Contract. Where the manner of manufacture and execution is not set out in the Contract, the work shall be executed in a proper, workmanlike and careful manner, with properly equipped facilities and non-hazardous Materials, and in accordance with modern recognized good practice.

7.2. Source of material

Sources of Materials being supplied shall be intimated to the Engineer and are subject to his approval. Materials that are not specified in the Contract document shall conform to the relevant Indian Standards or in their absence conform to any International Standard approved by the Engineer.

Save as otherwise expressly provided in the contract, samples shall be supplied by the Contractor at his own cost.

7.3. Delivery to Site

The Contractor shall be responsible for procurement, transport, receiving, unloading and safe keeping of all Plant, Rolling Stock, Construction Materials, Contractor's Equipment and other things required for the completion of the Works.

7.4. Inspection

The Employer and the Engineer shall at all reasonable times

a. have full access to all parts of the Site and to all placesfrom which natural materials are being obtained, and

b. during production, manufacture, fabrication and construction (at the site and elsewhere) be entitled to inspect, examine, measure and test the materials and workmanship, and to checkthe progress of manufacture, of all Plant, goods, construction and Materials to be supplied under the Contract.

The Contractor shall give the Engineer full opportunity to carry out these activities including providing access, facilities, permissions and safety equipment. No such activity/inspection shall relieve the Contractor from any obligation or responsibility.

7.5. Testing

This sub clause shall apply to all tests specified in the Contract, other than the Tests after Completion.
The Contractor shall provide all documents and other information necessary for all types of testing and such assistance, labour, materials, electricity, fuel, stores, apparatus and instruments as are necessary to carry out such tests efficiently.

The Contractor shall agree, with the Engineer, the timeand place for the testing of any Plant, goods, Materials and other parts of the Works as specified in the Contract. The employer/Engineer may instruct the contractor for any additional test, at employer’s cost.

The Engineer shall give the Contractor not less than 24 hours' notice of his intention to attend the tests.

If the Engineer does not attend at the time and place agreed, or if the Contractor and the Engineer agree that the Engineer shall not attend, the Contractor may proceed with the tests, unless the Engineer instructs the Contractor otherwise. Such tests shall be deemed to have been made in the Engineer's presence.

The Contractor shall promptly forward to the Engineer duly certified reports of the tests. If the Engineer has not attended the tests, he shall accept the readings as accurate. When the specified tests have been passed, the Engineer shall endorse the Contractor's test certificate, or issue a certificate to him, to that effect.

The expense of conducting such Tests shall be borne by the Contractor. No such testing shall relieve the Contractor from any obligation or responsibility.

i. If, as a result of inspection, examination or testing, any 7.6. Rejection Plant, goods, Material, design or workmanship is found to be defective or otherwise not in accordance with the Contract, the Engineer may reject the same and by giving notice to the Contractor with reasons. The Contractor shall then promptly make good the defect and ensure that the rejected item after rectification complies with the Contract. ii. If the Engineer requires such Plant, goods, Material, design or workmanship to be retested, the tests shall be repeated under the same terms and conditions. If such rejection and retesting cause the Employer to incur additional costs, such costs shall be recoverable from the Contractor by the Employer and may be deducted by the Employer from any sum due, or to become due, to the Contractor.

iii. Notwithstanding any previous Test or certification, the Engineer shall have the authority to instruct the Contractor:

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a. To remove from the Site and replace any plant orMaterials which is not in accordance with the Contract.

b. To remove and re-execute any other work which is notin accordance with the Contract.

c. Execute any work which is urgently required for thesafety of the Works, whether because of an accident, unforeseeable event or otherwise.

iv. In case of default on the part of the Contractor in carrying out such order, the Employer shall be entitled to employ and pay other parties, to carry out the same, and all expenses consequent thereof or incidental thereto, shall be recoverable from the Contractor or may be deducted by the Employer from any sum which may be due to the Contractor..

Cost of uncovering the work

and make good such part or parts, to the satisfaction of the Engineer. If

7.7. Liability after Inspection and Testing

The Contractor shall not be released from any liability or obligation under the Contract by reason of any such inspection or testing or witnessing of testing, or by the submission of reports of inspection or testing to the Engineer.

7.8. Ownership of Plant and Materials

Each item of Plant, goods, and Material shall become the property of the Employer, when it is delivered to Site or payment thereof, either in part or full, has been made. The Contractor shall however continue to bear the risk in respect of such items which continue to remain in his custody.

7.9. Cost of Employer's Attendance Including Travel

The Employer shall bear the costs of attendance including travel by the Employer or his Representative for the purposes of SubClauses 7.4 and 7.5 above. The cost of attendance including travel by the Employer, Engineer or his Representative for the purpose of Sub-clause 7.6 shall be borne by the Contractor.

7.10. Covering up of Works

Examination of work before covering up already covered up

7.10.1. No work or part of work shall be covered up or put out of view, without the prior approval of the Engineer or the Engineer's Representative.

any such part or parts have been covered up, or put out of view after compliance with the requirement of Sub-clause 7.11.4 and the Works are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating and making good the same, shall be borne by the Employer, but if the Works are found to be defective, costs shall be borne by the Contractor.

7.10.2. The Contractor shall uncover any part or parts of the Works, or make openings in or through the same, as the Engineer may from time to time direct, and shall reinstate

In case after completion of a part of the Work, the part of Work is not fully consistent with the Employer's Requirements and there is no way to change the same, in that case, the same (provided it has no implication on safety and operation) shall be accepted only at a Contractor's deemed variation at lower negotiated price.

The decision of the Engineer in this regard shall be final and binding on the Contractor.

7.11. Tests after Completion

Contractor's Obligations 7.11.1. The Contractor shall carry out the Tests on Completion at his own cost in accordance with the Contract after providing the documents in accordance with Sub-Clauses 5.4 and 5.5. The Contractor shall give, to the Engineer, 21 days' notice of the date after which the Contractor will be ready to carry out the Tests on Completion. Unless otherwise agreed, such Tests shall be carried out within 14 days after this date, on such day or days as the Engineer shall instruct.

Unless otherwise stated in Special Conditions of Contract, the Tests on Completion shall be carried out in the following sequence

a. pre-commissioning test, which shall include appropriateinstructions and ("dry" or "cold") functional tests to demonstrate that each item of the Plant, goods and Work can safely undertake the next stage

b. Commissioning Test shall include the specifiedoperational tests to demonstrate Works or Sections can operated safely and as specified under all available operating condition

c. trial operation which shall demonstrate that the Works orSection perform reliably and in accordance with the Contract

The Contractor at his cost shall arrange all tools, equipment, gadgets, facilities or as deemed necessary by the Engineer for such tests, in considering the results of the Tests on Completion, the Engineer shall make allowances for the effect of any use of the Works by the Employer on the performance or other characteristics of the Works. As soon as the Works, or a Section, have passed the Tests on Completion described in subparagraphs (a), (b) or (c), the Contractor shall provide the Engineer and the Employer with a certified report of the results of all such Tests.

Delayed Tests 7.11.2. If the Engineer opines that Tests on Completion are being unduly delayed by the Contractor, the Engineer may by notice require the Contractor to carry out such Tests within 21 days after the receipt of the notice. The Contractor shall carry out such Tests on such day or days as the Contractor may fix and of which he shall give notice to the Engineer.

If the Contractor fails to carry out the Tests on Completion within 21 days, the Engineer may proceed with such Tests at the risk and cost of the Contractor. The Tests on Completion then shall be deemed to have been carried out in the presence of the Contractor and the results of such Tests shall be accepted as accurate.

Retesting

7.11.3. If the Works, or a part thereof, or a Section, fail to pass the Tests on Completion, Sub-Clause 7.6 “Rejection” shall apply, and the Engineer or the employer may require such failed Tests, and the Tests on Completion on any related work, to be repeated under the same terms and conditions.

Failure to Pass Tests on Completion

7.11.4. If the Works, or a part thereof, or a Section, fail to pass the Tests

on Completion repeated under Sub-Clause 7.11.4, the Engineer shall be entitled to:

a. order further repetition of Tests on Completion under Sub-Clause 7.11.4;

b. reject the Works, or a part thereof, or a Section (as thecase may be), in which event the Employer shall have the same remedies against the Contractor as are provided under Clause 13; or

c. issue a Taking Over Certificate, if the Employer sorequires. The Contract Price shall then be reduced by such amount asdetermined by the Engineer and as shall be appropriate to cover the reduced value to the Employer as a result of this failure. The Contractor shall then proceed in accordance with his other obligations under the Contract.

7.12. Integrated

testing and system commissioning

Integrated Testing

7.12.1. Tests on Completion shall also include Integrated Testing where applicable as per the contract conditions. The Contractor shall, following satisfactory completion of tests on his works, equipment, sub-systems or system, perform, at the direction of the Engineer, programme of tests to verify and confirm the compatibility and complete performance of his works, equipment, sub-systems or system with the works, equipment, sub-systems or system provided by others.

Compilation of Test Results

7.12.2. The results of the Integrated Testing and Commissioning shall be compiled and evaluated by the Engineer and the Contractor.

Retesting

7.12.3. If the Works, or a part thereof, or a Section, fail to pass the Integrated Testing and Commissioning, the Engineer shall require such failed Tests, to be repeated under the same terms and conditions. If such failure and retesting result from a default of the Contractor and cause the Employer to incur additional costs, the same shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due, or to become due, to the Contractor.

Failure to Pass Test

7.12.4. If theWorks, or a part thereof, or a Section, fail to pass Integrated Testing and Commissioning and the Contractor in consequence proposes to make any adjustment or modification to the Works or a part thereof, or a section, the Engineer may, with the approval of the Employer, instruct the Contractor to carry out such adjustment or modification, at his own cost and to satisfy the requirements of Integrated Testing and Commissioning within such time as the Employer / Engineer may deem to be reasonable.

Statutory Requirements

7.12.5. The Contractor along with others shall carry out all statutory tests and trials, under the supervision of the Engineer, necessary for obtaining sanction of the competent authority for opening the system for public carriage of passengers.

8. Time Management

8.1. Commencement of Works

The Contractor shall commence the Works on the date specified in the Notice of Award or if no date is specified in the Notice of Award, on the date specified in an instruction in writing to that effect from the Engineer (Notice to Proceed). Thereafter the Contractor shall proceed with due diligence, without delay, and in accordance with the programme or any revised or modified programme of the Works. Time will be the essence of Contract and time for Completion shall run from the date the Contractor is to commence the Works under this Clause.

The Contractor shall not commence the construction, manufacture or installation of the Works or of any part of the Works unless and until the Engineer has endorsed the relevant Working Drawings in accordance with the Employer's Requirements.

8.2. Time for Time is the essence of Contract and will remain so at all times Completion during the pendency of the Contract including the extended period of Contract. The Contractor shall ensure defect free completion and have passed the tests on the completion, including integrated testing where ever in the scope of work and commissioning of the whole of the Works and/or parts thereof before the same is taken over by the Employer.

8.3. Delay In case of delay on the part of the Contractor, the Contractor shall be liable to pay liquidated damages and any other compensation for the damages suffered by the Employer as per clause 8.5. This is without prejudice to the right of the Employer to rescind the Contract.

Failure or delay by the Employer or the Engineer, to hand over to the Contractor the Site necessary for execution of Works, or any part of the Works, or to give necessary notice to commence the Works, or to provide necessary Drawings or instructions or clarifications or to supply any material, plant or machinery, which under the Contract, is the responsibility of the Employer, shall in no way affect or vitiate the Contract or alter the character thereof; or entitle the Contractor to damages or compensation thereof but in any such case, the Engineer shall extend the time period for the completion of the Contract, as in his opinion is / are reasonable.

8.4. Extension of Time for Completion

Extension of Time

8.4.1. The Contractor may apply for an extension of the Time for Completion if the Work is or will be delayed either before or after the Time for Completion by any of the following causes:

a. “Force Majeure” referred to in Clause 16

b. The Contractor’s work held up for not being givenpossession of or access to the Site in accordance with the Contract

c. Instruction of the Engineer to suspend the Works and theContractor not being in default as to reasons of suspension.

d. Acts or omissions of other Designated Contractors inexecuting work not forming part of this Contract and on whose performance, the performance of the Contractor necessarily depends.

e. Any act of prevention or Breach of Contract by the Employer and not mentioned in this Clause

f. Any order of Court restraining the performance of the Contract in full or in any part thereof

g. Any other event or occurrence which, according to theEmployer is not due to the Contractor's failure or fault and is beyond his control without Employer being responsible for the same.

h. An Employer's Variation

However, the Contractor shall not be entitled to any extension of time where the instructions or acts of the Employer or the Engineer are necessitated by or intended to cure any default of or breach of Contract by the Contractor or where any delay is due to

a. the failure of sub-contractor, to commence or to carry outwork in due time,

b. non-availability, or shortage of Contractor's equipment,labour, utility services, Plant and Materials,

c. inclement weather conditions, and

d. the Contractor not fulfilling his obligations under Sub-Clause 4.4.

If the Contractor considers himself to be entitled to an extension of time for Completion, he shall give notice to the Engineer of such intention as soon as possible and in any event within 28 days of the start of the event giving rise to the delay and full and final supporting details of his application within 21 days of the last day of delay, together with any notice required by the Contract and relevant to such Clause.

The Engineer shall proceed in accordance with Sub-Clause 3.5 to agree or determine either prospectively or retrospectively such extension of the Time for Completion as may be due. The Engineer shall notify the Contractor accordingly. The extension of time including that of key date shall not entitle the contractor to retain the advance which shall be governed by Clause 11.2.

Extension of time for completion for other reasons

8.4.2. The Contractor shall not be entitled to an extension of time by reason of any delay to any activity in the carrying out of the Works unless in the opinion of the Engineer such delay results in or may be expected to result in a delay to completion of the Works, or achievement of any Stage by the relevant Key Date. Whether or not the Contractor fails to achieve any Milestone by reason of any delay shall not by itself be material to the Contractor's entitlement to an extension of time.

Any extension to a Key Date shall not by itself entitle the Contractor to an extension to any other Key Date.

Extension of time for delays due to Contractor

8.4.3. If the delay in the completion of the whole Works or a portion of the Works, for which an earlier completion period is stipulated, is due to the Contractor's failure or fault, and the Engineer is of the view that the remaining Works or the portions of Works can be completed by the Contractor in a reasonable and acceptable short time, then, the Engineer may allow the Contractor extension or further extension of time at its discretion with or without liquidated damages, for completion, as he may decide.

8.5. Liquidated Damages for Delay

Time is the essence of the Contract. Appendix to the Form of Tender shall include in respect of the Works and in respect of any Stage, a percentage of the total contract value which will be recoverable from the Contractor as liquidated damages for delay in completion of the Works or in achievement of a stage by a particular Key Date. The total amount of liquidated damages in respect of the Works in all stages shall, however, not exceed the limit of liquidated damages stated in the Appendix to the Form of Tender. The aforesaid liquidated damages do not, however, include the sums payable by the Employer to Designated Contractors on account of delay caused by the Contractor to Designated Contractors which sums shall be recoverable from the Contractor in addition to any liquidated damages payable under this clause, the total ceiling limit of which is 15% of the contract value including liquidated damages levied under the provision of Appendix to the Form of Tender.
The liquidated damages are recovered by the Employer from the Contractor for delay and not as penalty.

The Employer may, without prejudice to any other method of recovery, deduct the amount of such damages from any sum due, or to become due, to the Contractor. In the event of an extension of time being granted under Sub- Clause 8.3, the amount due under this Sub-Clause shall be recalculated accordingly, and any over-payment refunded. The payment or deduction of such damages shall not relieve the Contractor from his obligations to complete the Works, or from any other of his duties, obligations or responsibilities under the Contract.

The Contractor shall use and continue to use his best endeavours to avoid or reduce further delay to the Works, or any relevant Stages.

At any time after the Employer has become entitled to liquidated damages, the Engineer may give notice to the Contractor under Sub-Clause 13.1, requiring the Contractor to complete the Works within a specified reasonable time. Such action shall not prejudice the Employer's entitlements to recovery of liquidated damages, under this Sub-Clause and to terminate under Sub- Clause 13.2.

The decision of the Engineer as to the compensation payable by the Contractor under this Clause shall be final and binding.

8.6. Rate of Progress

If for any reason which does not entitle the Contractor to an extension of time, the rate of progress of the Works is at any time, in the opinion of the Engineer, too slow to ensure timely completion of the Works or achievement of any Stage by the relevant Key Date the Engineer may so notify the Contractor in writing. The Contractor shall thereupon take such steps as are necessary, or in default of taking such steps, shall take such steps as the Engineer may reasonably instruct in writing, to expedite progress so as to complete the Works or any Section in time or achieve any Stage by the relevant Key Date. The Contractor shall not be entitled to any additional payment for taking such steps.

If any steps taken by the Contractor in meeting his obligations under this Sub- Clause cause the Employer to incur additional costs, such costs shall be recoverable from the Contractor by the Employer and shall be deducted by the Employer from any sum due, or to become due, to the Contractor.

If, in the opinion of the Engineer, the steps taken by the contractor to expedite the progress are not adequate, the Engineer may take a recourse as per Clause 13.2.4 of this GCC.

8.7. Suspension of Work

The Engineer may at any time instruct the Contractor to suspend progress of part or all of the Works. During suspension, the Contractor shall protect, store and secure such part or whole of the Works against any deterioration, loss or damage.

8.8. Consequences of Suspension

The Contractor shall not be entitled to extra cost (if any), incurred by him, during the period of suspension of Work., if such suspension is

a. provided for in the Contract, or

b. necessary for proper execution of Woks or by reasons ofweather condition or by some default on the part of the Contractor, or

c. necessary for the safety of Works or any part thereof or

d. necessary for the safety of adjoining public or otherproperty or safety of the public or workmen or those who have to be at the site or

to ensure safety and to avoid disruption of traffic and utilities, as also to permit fast repairs and restoration of any damaged utilities. If suspension is ordered by the Engineer for reasons other than those mentioned in sub-clause 8.8 then the Contractor's entitlement are in the table below

Suspension Period	Extension of Time	Compensation for the suspension period	Remarks

Upto 14 days	NO	NO	Engineer may, at his sole discretion, give extension of time in exceptional circumstances
15 – 30 days	YES	NO	Extension of time as considered proper by the Engineer
Above 30 days	YES	As per Daily rate of wages for idle labour/employees 70% of the rate for hire charges for idle plant and machinery (excluding cost of fuel and lubricants) 15% above all these items to cover overhead costs	Compensation as assessed by the Engineer on submission of documentary proof by the Contractor to Engineer's satisfaction
Above 90 days If Contractor asks for fore closure	NO	As per Clause 13.3.4	Contractor may ask for closure of the Contract, or deletion from the Contract of that part of Works which has been suspended

8.9. Resumption of Work

After receipt of permission or of an instruction to proceed, the Contractor shall, after notice to the Engineer, and together with the Engineer, examine the Works, Plant, Rolling Stock and Materials affected by the suspension. The Contractor shall make good any deterioration or defect in or loss of the Works, Plant, Rolling Stock and Materials, which has occurred during the suspension.

9. Employer's Taking Over

9.1. Taking Over Certificate

The Works shall be taken over by the Employer when they have been completed in accordance with the Contract, have passed the Tests on Completion, including Integrated Testing and Commissioning where ever applicable as per the contract, and a Taking Over Certificate for the Works shall be issued. If the Works are divided into Sections, the Contractor shall be entitled to apply for a Taking Over Certificate for each Section.

The Contractor may apply by notice to the Engineer for a TakingOver-Certificate not earlier than 14 days before the works or section (as the case may be) will, in the Contractor's opinion, be complete and ready

for taking over. The Engineer shall, within 28 days after the receipt of the Contractor's application shall conduct a complete joint survey of the works including carrying out any tests prescribed in the contract and prepare a list of defects and outstanding works and:

a. issue the Taking Over Certificate to the Contractor,stating the date on which the Works or Section were completed, including the Tests on Completion and Integrated Testing and Commissioning where ever applicable as per the contract in accordance with the Contract if defects and/or outstanding works are minor that does not affect the use and safety of the Works or Section for their intended purposes The list of such works along with the target date of completion for each work shall be enclosed with the taking over certificate and completion of all these works /rectification of defects within the stipulated time shall be the responsibility of the contractor and any failure in it may be considered a reason by the Engineer to cancel the taking over certificate issued earlier; or

b. reject the application, giving his reasons and specifyingthe work required to be done by the Contractor to enable the Taking Over Certificate to be issued. The Contractor shall then complete such work before issuing a further notice under this Sub-Clause.

9.2. Taking over of Parts of the Works

The Engineer may, at the sole discretion of the Employer issue a Taking Over Certificate for any part of the Permanent Works by following the procedure stipulated in Clause 9.1 above if:

a. the Employer uses that part of the Works for revenue service before the Taking Over Certificate is issued for the entire work.

b. the balance part is not completed not due to default ofthe contractor and contractual date of completion for the completed part is over.

10. Defects Liability

10.1. Completion of Outstanding Work and Remedying Defects

"Defects Liability Period" shall mean the defects liability period stated in the Special Conditions of Contract calculated from the date of taking over of the Works. Provided that, if any part of the Works or sub-systems or component of that part has been replaced, renewed or repaired except minor repair, the "Defects Liability Period" in respect of that part or sub-system or components of that part shall start from the date such replacement, renewal or repair has been completed to the satisfaction of the Engineer.

In order that the Construction and/or Manufacture Documents and the Works shall be in the condition required by the Contract (fair wear and tear excepted) at, or as soon as practicable after the expiry of the Contract Period, the Contractor shall execute all such work of amendment, reconstruction, and remedying defects or damage, as may be instructed in writing by the Employer or the Engineer during the Defect Liability Period.

10.2. Cost of Remedying Defects

All work referred to in Sub-Clause 10.1shall be executed by the Contractor at his own cost, if the necessity for such work is due to:

a. the design of the Works;

b. Plant, Rolling Stock, Materials or workmanship not beingin accordance with the Contract; or

c. failure by the Contractor to comply with any of his otherobligations. If in the opinion of the Engineer, such necessity is due to any other cause, he shall determine an adjustment to the Contract Price, with the approval of the Employer, and shall notify the Contractor accordingly. In this event, Sub-Clause 12.3 shall apply to such work.

10.3. Extension of Contract Period

The Contract Period shall be extended by a period, after the Works are taken over, during which the Works or any Section or item of Plant, Rolling Stock, cannot be used, for the purposes for which they are intended, by reason of a defect or damage.
When delivery of Plant, Rolling Stock, and/or Materials, or erection of Plant, or installation of Materials, has been suspended under Sub-Clause 8.7, the Contractor's obligations under this Sub-Clause shall not apply to any defects or damage occurring more than three years after the Plant, Rolling Stock and/or Materials would otherwise have been delivered, erected and taken over.

10.4. Failure to Remedy Defects

If the Contractor fails to remedy any defect or damage within such time as the Employer / Engineer may deem to be reasonable, the Employer or the Engineer may fix a date on or by which to remedy the defect or damage and givethe Contractor reasonable notice of such date. If the Contractor fails to remedy the defect or damage by such date and the necessity for such work is due to a cause stated in Sub-Clause 10.2(a), (b) or (c), the Employer may (at his sole discretion):

a. carry out the work himself or by others, in a reasonablemanner and at the Contractor's risk and cost, but the Contractor shall have no responsibility for such work: the costs incurred by the Employer in remedying the defect or damage shall be recoverable from the Contractor by the Employer

b. require the Engineer to determine and certify a reasonable reduction in the Contract Price; or

c. if the defect or damage is such that the Employer hasbeen deprived of substantially the whole of the benefit of the Works or parts of the Works, terminate the Contract in respect of such parts of the Works as cannot be put to the intended use, the Employer shall then be entitled to recover all sums paid for such parts of the Works together with the cost of dismantling the same, clearing the Site and returning Plant, Rolling Stock and Materials to the Contractor, and Sub-Clause 13 shall not apply.

10.5. Removal of

Defective Work	If the defect or damage is such that it cannot be remedied expeditiously on the Site and if the Employer gives consent, the Contractor may, remove from the Site for the purposes of repair any part of the Works, which is defective or damaged. This consent may require the Contractor to increase the amount of Performance Security by the full replacement cost of these items or to provide other appropriate security acceptable to the Employer.
10.6. Further Tests	If the remedying of any defect or damage is such that it may affect the performance of the Works, the Engineer may require that Tests on Completion, including Integrated Testing, be repeated to the extent necessary. The requirement shall be made by notice within 28 days after the defect or damage is remedied. Such Tests shall be carried out in accordance with Clause 7.11
10.7. Right of Access	Until the Performance Certificate has been issued, the Contractor shall have the right of access to all parts of the Works and to records of the working and performance of the Works, except as may be inconsistent with any reasonable security restrictions by the organisation responsible for operating the Works.
10.8. Contractor to Search	The Contractor shall, if required by the Engineer, search for the cause of any defect, under the direction of the Engineer. Unless the defect is one for which the Contractor is liable, the Cost of such search shall be added to the Contract Price.
10.9. Performance Certificate	The Contract shall not be considered to be completed until the Performance Certificate has been signed by the Engineer and delivered to the Contractor at the end of 'Defect Liability Period, stating the date on which the Contractor completed his obligations related to completion of works and rectification of defects during Defect Liability Period. to the Engineer's satisfaction. Only the Performance Certificate shall be deemed to constitute approval of the Works.
10.10. Unfulfilled Obligations	After the Performance Certificate has been issued, the Contractor and the Employer shall remain liable for the fulfillment of any obligation, which remains unperformed at that lime. For the purposes of determining the nature and extent of any such obligation, the Contract shall be deemed to remain in force.
10.11. Emergency defect rectification	If any defect or damage is one requiring immediate attention from safety, environmental or operational viewpoint, the Engineer has the authority to proceed with rectification in any manner suitable and deduct such sums from the Contract Price.

11. Contract Price and Payment

11.1. The Contract Price

Inclusions / Exclusions — 11.1.1.

i. Unless otherwise stated in the Special Conditions of Contract the Contract Price, subject any to any adjustment thereto in accordance with the Contract shall be all inclusive (including all taxes, duties, royalties etc.)

ii. Nothing extra shall be payable over the quoted rates, notwithstanding any provision to the contrary in any law for the time being in force, save and except what is specifically provided in General or Special Conditions of Contract.

iii. The reimbursement (as per this Sub-clause) of whatsoever nature shall be provided only for Permanent Works. No reimbursement (as per this Sub-clause) shall be provided for Temporary Works and fuel.

Maintaining Records and Availing Exemptions — 11.1.2.

i. In the event of exemption of custom duties, excise duties, GST (CGST/SGST/IGST etc.) or any other cess/levy being granted by the Government in respect of the Works, the benefit of the same shall be passed on to Employer. The Contractor shall therefore maintain meticulous records of all the taxes and duties paid and provide the same as and when required by the Employer, so that the Employer is able to avail the reimbursement for which NMRC may issue a procedure order separately.
Alternatively, the Employer may direct the Contractor to get the reimbursements based on exemption certificates / government's order and it shall be obligatory on part of the Contractor to get the reimbursements from the statutory authorities and pass on the benefit to NMRC.

ii. In case of Contractor's failure in availing the exemptions as stipulated above, the recovery of equivalent amount will be made from Contractor's dues.

Adjust in Contract Price — 11.1.3.

Adjustment in contract price on account of inflation shall be done only if a "Price Variation Formula" is given in the special conditions of contract otherwise it will be a fixed price contract.

Change in Taxes/Duty — 11.1.4.

The Contract Price shall not be adjusted to take into account any increase or decrease in cost resulting from any change in taxes, duties, levies from the last date of submission of the Tender to the completion date including the date of the extended period of Contract unless a contrary provision exists in Special Conditions of Contract.

11.2. Advances

Mobilisation Advance	11.2.1.	Mobilisation advance shall be generally 5% of original contract value payable in two equal instalments or as mentioned in the Special Conditions of Contract. The first instalment shall be paid after mobilisation has started and next instalment shall be paid after satisfactory utilization of earlier instalment. Mobilisation advance shall be paid interest free against acceptable Bank Guarantee from a scheduled commercial bank in India. The value of Bank Guarantee taken towards security of "Mobilization Advance" shall be 110% of the advance taken by the Contractor. The Contractor, once the 50% of mobilisation advance has been recovered, shall have a one-time option to reduce the Bank Guarantee for the mobilisation advance by the amount recovered
Advance against and Plant Machinery	11.2.2.	Plant and machinery advance shall generally be 5% of original contract value or as specified in Special Conditions of Contract. This advance is payable against plant, equipment and machinery, provided the same have reached the site or in the case of new items meant specifically for the work firm purchase order has been placed and the invoices received. The advance will be given only if the plant/machinery has been purchased for this contract and not for those which are already in the books of the contractor. The plant and machinery shall be valued by the Engineer as follows: a. New Items: 80% of purchase price b. Second hand items in working order: 80% of thedepreciated value as assessed by Engineer c. Items valued at less than Rs.5,00,000 per unit: Not to beconsidered The total advance for Plant and Machinery shall be limited to 5%. This advance shall be paid interest free against acceptable Bank Guarantee from a scheduled commercial bank in India. The value of Bank Guarantee taken towards security of "Plant and Machinery advance" shall be 110% of the advance taken by the Contractor. The Contractor, once the 50% of the Plant and Machinery advance has been recovered, shall have a one-time option to reduce the Bank Guarantee for the Plant and Machinery advance by the amount recovered.
Written Request for Advances	11.2.3.	Advances as admissible, shall be payable only on Contractor's written request to the Employer.

Recovery of Advances	11.2.4.	a. The recovery of Advances shall commence when 20%of the original contract value of the work has been paid and it will be completed by the time 85% of the Original Contract Value has been paid or the original completion date whichever is earlier. As far as possible the recovery of advances shall be limited to 30% of an account bill. b. No advance shall be given after 40% of the originalcontract amount has been paid. c. The contractor shall always have the option to have therecoveries commenced and / or completed earlier, and / or to have recoveries affected in installments of higher amounts and also repay part or whole of the advance by direct payment rather than through On-account Bills. d. In case the Contract is terminated due to default of thecontractor or rescinded/foreclosed due to any other reason, the contractor shall return the unrecovered amount of all advances within 15 days of issue of notice of termination/ rescission/ foreclosure of the contract and if the Contractor fails to do so due to any reason whatsoever, then interest at an interest rate equal to State Bank of India's Marginal Cost of fund based Lending Rate (MCLR) applicable for the tenure of 01 year prevailing on the date of issue of notice of termination/ rescission/ foreclosure plus 3% Penal Interest per annum shall be charged on the unrecovered amount of such advances from 16th day onwards compounded quarterly till the same is returned by the contractor.
Interest in Case of Delay in Repayment of Advances	11.2.5.	Should there be delay in the progress and completion of work, as a result of which it is not possible to recover the advance and interest thereon, before the date of completion stipulated in the Contract, then the interest to be charged from the Contractor on the remaining portion of the advance beyond the original completion date specified in the Contract, shall be the State Bank of India Marginal Cost of fund based Lending Rate (MCLR) applicable for the tenure of 01 year prevailing on the original completion date specified in the Contract plus 3% Penal Interest per annum.
Advances to be Used only for This Work.	11.2.6.	The advances shall be used by the Contractor strictly for the purpose of the Contract, and for the purpose for which they are paid. Under no circumstances, shall the advances be diverted for other purposes. Any such diversion shall be construed as a breach of the Contract and the Contractor shall be asked to return the advance at once and pay interest at 15% per annum till the advance is recovered back from him. The Contractor shall return the advance and pay the interest in one go without demur. Employer retains the right for any other remedy prescribed for breach of Contract in this regard. The Contractor, if required by the Engineer shall provide the details of utilisation of Mobilization advance.

11.3. Provisional Payment Against Material at Site

Provisional Payment Against Material at Site

11.3.1. A provisional payment on account of main contraction materials required for the Permanent Works, shall be paid on request of the Contractor after these materials are brought to Site, against an Indemnity Bond in a form acceptable to Employer is duly executed. The payment shall be limited to 80% of the actual value or assessed value of these materials and the total of such provisional payment on account of construction materials at a time shall be limited to three percent of original contract value or likely average consumption of such materials for three months, whichever is less and at any time the total outstanding provisional payment against material at site shall not exceed four percent of the original control value. The valuation of the average consumption of such main construction materials shall be approved by the Engineer, whose decision shall be final. Materials which are of perishable nature should be adequately insured.

Written Request for Advances/Provisional Payment against material at site

11.3.2. Advances and provisional payments as admissible, shall be payable only on Contractor's written request to the Employer/Engineer.

Recovery of Advances/Provisional Payment

11.3.3. a. The recovery of Advances shall commence when 20% of the original Contract Value of the work has been paid and it will be completed by the time of original Date of Completion. As far as possible the recovery of advances shall be limited to 30% of an account bill.

b. No advance shall be given after 40% of the originalcontract amount has been paid. However, provisional payment against material at site will continue to be paid as stipulated in Clause 11.3. till end of the contract period.

c. In case of provisional payment against Materials, theamount consumed every month shall be recovered from the next months on account bill and completing the recovery in 3 monthly instalments. In case recovery could not be made due to any reason, interest will be charged as per Clause 11.2.5.

11.4. Application for Interim Payment Certificates

11.4.1. In case of 'Lump Sum' contract with cost centre and Milestone payment, the fixed Lump Sum Price shall be apportioned by the Contractor amongst the various Cost Centres. The amount thus apportioned under each Cost Centre will be further apportioned amongst various Milestones with the approval of the Employer. The Contractor shall be entitled to submit to the Engineer requests for interim payments only upon the achievement of one or more of the Milestones described in the Cost Centre.

At the beginning of each month, the Engineer shall issue to the Contractor certificate in respect of each Milestone due to be achieved in the preceding month stating:

a. the date on which the Milestone was achieved; or

b. the non-achievement of the Milestone.

The Contractor shall submit a statement in three copies to the Engineer at the beginning of each month, in a form approved by the Engineer, showing the amounts to which the Contractor is entitled, together with supporting documents, including Milestone Certificates. The statement shall include the following items, as applicable, which shall be expressed in the various currencies in which the Contract Price is payable, in the sequence listed:

a. the amount due in respect of Milestones certifiedachieved by the Engineer under each Cost Centre;

b. any amounts to be added and deducted for the advancepayments and recovery thereof;

c. any other additions or deductions is due and approvedby the Engineer in accordance with the Contract; and

the deduction of the amounts certified in all previous Interim Payment Certificates.

The Contractor shall not submit more than one request for interim payment per month.

If any Milestone is not achieved by the end of the month in which it is scheduled to be achieved, the Engineer shall suspend the payment relating to the Cost Centre in which the Milestone is included.

Payments suspended under this Clause shall be resumed by being included in the next application for interim payment made after the Milestone is achieved.

11.4.2.

In case of 'Lump Sum' or Item rate' contracts with payment schedule, the contractor shall be entitled to be paid from time to time, normally once in a calendar month, by way of 'on account' bill as per the payment schedule indicated in Bill of Quantity (BOQ) or as finally approved by the Engineer.

11.5. Issue of Interim Payment Certificates

No amount will be certified or paid until the Employer has received, and approved, the Performance security and the parent Company Undertakings and Guarantees in accordance with Sub-Clause 4.2. Thereafter, the Engineer shall, within 21 days of receiving a statement and supporting documents, deliver to the

Employer, with a copy to the Contractor, an Interim Payment Certificate showing the amount which the Engineer considers to be due; if no payment is considered to be due, the Engineer shall promptly notify the Contractor accordingly.

Where only a part of the payment applied for is disputed, payment certificate shall be issued for the undisputed amount.

The Engineer shall have the power to omit from any of the contractor's requests for payment the value of any work executed or Materials supplied or services rendered, with which he may for the time being be dissatisfied and for that purpose and for any other reason which to him may seem proper, may delete, correct or modify the sum(s) previously certified by him as being due to the Contractor.

11.6. Payment- Interim and Final

Unless otherwise stated in Special Conditions of Contract,

a. After preliminary scrutiny and certification by theEngineer, payment of 80% of the certified interim amount shall be made by the Employer within 07 days. The amount certified shall account for all deductions, including statutory deductions, recoveries for advances and any amounts due from the Contractor. The balance 20% shall be paid within 28 days, from the date of the preliminary certification of the bill by the Engineer.

b. Next 80% interim payment shall be made only after100% payment of preceding interim payment certified has been completed.

c. Any such payment made to contractor by Employer,shall not constitute any acceptance of the measurements or bill of quantities by the Employer and the classification entered in the measurement books or bills. The employer shall have right to recover any excess payment made in either 80% interim payment of bill or earlier bill from balance 20% bill or subsequent bill respectively. However, if such excess payment exceeds the balance 20% bill or subsequent bill respectively, the contractor shall on demand from the Engineer or Employer immediately refund the extra amount to the employer within 7 days, failing which the contractor shall have to pay interest at the rate equal to State Bank of India's Marginal Cost of fund based Lending Rate (MLCR) applicable for the tenure of 01 year prevailing on date plus 3% Penal interest per annum with monthly rest till the said extra amount is paid back by the Contractor.

d. The Employer shall pay the amount certified in the FinalPayment Certificate within 56 days from the date of issue of the Certificate.

Payments shall be made into a bank account, nominated by the Contractor in Indian rupees in a bank in India unless otherwise permitted in Special Conditions of Contract. If payments are to be made in more than one currency, separate bank accounts may be nominated by the Contractor for each currency, and payments shall be made by the Employer accordingly.

11.7. Statement at Completion

Not later than 60 days after the issue of the Taking Over Certificate for the whole of Works, the Contractor shall submit, to the Engineer, three copies of a statement at completion with supporting documents, showing in detail, in the form approved by the Engineer under Sub-Clause 11.4.:

a. the final value of all work done in accordance with theContract, up to the date stated in such Taking Over Certificate,

b. any further sums which the Contractor considers to bedue, and

c. an estimate of amounts which the Contractor considerswill become due to him under the Contract.

The estimated amounts shall be shown separately in such statement at completion. The Engineer shall certify payment under Sub-Clause 11.5

11.8. Application for Final Payment Certificate

Not later than 56 days after the issue of the Performance Certificate, the Contractor shall submit to the Engineer three copies of a draft final statement with supporting documents showing in detail, in a form approved by the Engineer:

a. the value of all work done in accordance with the Contract, and

b. any further sums which the Contractor considers to bedue to him under the Contract or otherwise.

If the Engineer disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Engineer may reasonably require and shall make changes in the draft as may be agreed between them. The Contractor shall then prepare and submit to the Engineer the Final Statement as agreed.

If, following discussions between the Engineer and the Contractor and any changes to the draft final statement which may be agreed between them, it becomes evident that a dispute exists, the Employer shall pay those parts of the draft final statement as certified by the Engineer as not being in dispute. The remainder of the dispute may then be resolved under Clause 17, in which case the Contractor shall then prepare and submit to the Engineer a Final Statement in accordance with the outcome of the dispute.

11.9. Discharge

When submitting the final statement, the Contractor shall submit a written discharge which confirms that the total of the Final Statement represents full and final settlement of all monies due to the Contractor under the Contract. Such discharge may state that it shall become effective only after payment due under the
Final Payment Certificate has been made and the Performance security referred to in Sub-Clause 4.2 has been returned to the Contractor.

11.10. Issue of Final Payment Certificate

The Engineer shall issue to the Employer, with a copy to the Contractor, the Final Payment Certificate within 28 days after receiving the Final Statement and written discharge in accordance with Sub-Clause 11.7 and 11.8, stating:

a. the amount which is finally due, and

b. after giving credit to the Employer for all amountspreviously paid by the Employer and for all sums to which the Employer is entitled, the balance, if any, due from the Employer to the Contractor or from the Contractor to the Employer, as the case may be

If the Contractor has not applied for a Final Payment Certificate in accordance with Sub-Clauses 11.8 and 11.9, the Engineer shall request the Contractor to do so. If the Contractor fails to make such an application within a period of 28 days, the Engineer shall issue the Final Payment Certificate for such amount as he considers to be due.

11.11. Cessation of Employer's Liability

In respect of any matter or thing arising out of (or in connection with) the contract or execution of the Works before the issue of the Taking Over Certificate for the whole of the Works, the Employer shall not be liable to the Contractor unless the
Contractor shall have included a claim for it in his Statement at Completion described in Sub-Clause 11.7. For any such matter or thing arising after the issue of the Taking Over Certificate for the whole of the Works, the Employer shall not be liable to the Contractor unless the Contractor shall have included a claim for it in his Final Statement.

11.12. Calculation of Payments in Foreign Currency

All payments made by the Employer pursuant to the terms of the Contract shall be in the currency or currencies specified in the Contract. Wherever any sum in a foreign currency has to be converted into Indian Rupees for any purpose, the exchange rate to be employed for such conversion shall be the selling rate of exchange at the close of business of the State Bank of India 28 days before the latest date of submission of Tenders.

11.13. Round off

In every payment to the Contractor, sums of less than fifty paise shall be omitted and sums of fifty paise and more up to one rupee shall be reckoned as one rupee.

11.14. Payment By Cheque and E-Payment

All payments to the Contractor will be made by cheque or “EPayment” as desired by the Employer.

11.15. Tax Deduction at Source

Tax deductions will be made at source as per statutory requirement from every payment made to the Contractor at rates notified from time to time.

11.16. Production of Vouchers

i. The Contractor shall, whenever required by the Engineer, produce or cause to be produced for examination by the Engineer, any quotation, invoice, cost or other account books, vouchers, receipts, letters, memoranda or any copy of or extract from any such documents and also furnish information and returns, as may be required, relating to the execution of this Contract or relevant for verifying or ascertaining the cost of execution of this Contract or ascertaining the Materials supplied by the Contractor are in accordance with the Specifications laid down in the Contract. The Engineer's decision on the question of relevancy of any documents, information or returns shall be final and binding on the parties.

ii. If any part or item of the work is allowed to be carried out by a sub-Contractor, assignee or any subsidiary or allied firm, the Engineer shall have power to secure the books of such sub-Contractor, assignee or any subsidiary or allied firm through the Contractor and shall have power to examine and inspect the same. The above obligations are without prejudice to the obligations of the Contractor under any statute, rules or orders

11.17. Withholding And Lien For Sums Claimed

i. The Employer shall have lien over all or any moneys that may become due and payable to the Contractor under the Contract, and / or over the deposit of Performance Security or other amount or amounts made under the Contract and which may become payable to the Contractor.

ii. And further, unless the Contractor pays and clears immediately on demand any claim of the Employer, the Employer shall at all times be entitled to deduct the amount of the said claim from the moneys, securities and / or deposits which may have become or will become payable to the Contractor under these presents, or under any other Contract or transaction whatsoever between the Employer and the Contractor even if the matter stands referred to Arbitration. The Contractor shall have no claim for any interest or damage whatsoever in respect of any amounts withheld or treated as withheld under the lien referred to above and duly notified as such to the Contractor

11.18. Signature On Receipts For Payments

Every receipt of payment to Contractor including refund of the Performance Security shall be signed by the person authorized to do so on his behalf. In the event of death of any of the Contractor's partners in case the Contractor is a partnership firm, during the currency of the Contract, it is hereby expressly agreed that every receipt by any one of surviving Contractor's partners, shall, if so signed as aforesaid, be a good and sufficient discharge as aforesaid, provided that nothing in this Clause shall be deemed to prejudice or affect any claim, which the Employer may hereafter have against the legal representatives of any Contractor's partner so dying, for or in respect of breach of any of the conditions of the Contract. Provided also that nothing contained in this clause shall be deemed to prejudice or affect the respective rights and obligations of the Contractor's partners,

or of the legal heirs / representatives of any deceased Contractor / partner interest.

11.19. Post Payment Audit

It is an agreed term of the Contract, that the Employer reserves to himself the right to carry out a post payment audit and / or

11.20. Recovery of money due to the Employer

technical examination of the Works, and the Final bill including all supporting vouchers, abstracts, etc., and to make a claim on the Contractor for the refund of any excess amount paid to him, if as a result of such examination, any over-payment to him is discovered to have been made in respect of any work done or alleged to have been done by the Contractor, under the Contract. If any under-payment is discovered, the same shall be paid by the Employer to the Contractor. Such payments or recoveries, however, shall not carry any interest.

All damages (including, without limitation, liquidated damages), costs, charges, expenses, debts, or sums for which the Contractor is liable to the Employer under any provision of the Contract may be deducted by the Employer from monies due to the Contractor under the Contract including, without limitation, and the Employer shall have the power to recover any balance not so deducted from monies due to the Contractor under any other contract between the Employer and the Contractor.

When the Contractor has assigned to a third party the right to receive monies due, or, to become due, under the Contract to the Contractor or charged such monies in favour of a third party, the Employer's right to deduct damages (including without limitation liquidated damages), costs, charges, expenses, debts or sums for which the Contractor is liable to the Employer from monies due to the Contractor under the Contract shall be limited to the right expressed above.

12. Variations

12.1. Right to Vary

All Variations shall be recorded in a written instruction from the Engineer either as a Contractor's Variation or as an Employer's Variation and shall not be implemented by the Contractor without such an instruction in writing from the Engineer. No Variation shall in any way vitiate or invalidate the Contract. The Contractor shall not make any alteration and/or modification of the Works, unless and until the Engineer instructs or gives consent to a Variation. If the Construction and/or Manufacture Documents or Works are not in accordance with the Contract, the rectification shall not constitute a Variation.

Value Engineering or Innovation

12.2. Contractor’s Variations

Value Engineering Proposals	12.2.1.	The Contractor may submit to the Employer, in writing at its own cost, value engineering proposals for modifying the Employer's Requirements, provision of additional land, access or feasibility over and above that is provided in the Contract for the purpose of saving in time, construction or manufacture costs. The value engineering proposal shall not impair the essential character, functions or characteristics or the Work, including service life, economy of operation, ease of maintenance, desired appearance, or design and safety standards. The Contractor shall provide his value engineering proposal in a time limit prescribed by the Engineer. The Engineer's decision in this regard shall be communicated to the Contractor within a reasonable period of time. If by any reason the time limit specified by the Engineer is exceeded, the proposal may not be considered. The decision of the Engineer in this regard shall be final and binding.
Value Engineering Proposals – Contents	12.2.2.	If the Employer requires or accepts it, and if the Contractor wants to proceed with the proposal, the Contractor must provide (at no cost to the Employer) a detailed report prepared by a consultant acceptable to the Employer and which shall include: a. general description of the original Contract requirementsfor the Works and the proposed changes b. detail of all the proposed modifications to the drawings andspecifications c. detail of all Work and goods affected by the valueengineering proposal d. detailed estimate of the construction cost based on theoriginal Contract requirements and based on the proposed changes e. any resultant time extensions or reductions for the Contract f. statement to the extent of minimum saving expected. The Contractor's cost of preparing value engineering proposal shall be excluded in determining the estimated net savings in construction costs.
Value Engineering Proposals- Employer Review	12.2.3.	The Employer may in his sole discretion, accept or reject the value engineering proposal or any part thereof and determine the estimated net saving in the construction cost. The Employer shall not be liable for delays or damages to the Contractor due to any failure of the Employer to accept or act upon any value engineering proposal submitted pursuant to this Clause. If the submitted value engineering proposal is similar to a change / variation already under consideration by the Employer, the Employer may make such changes without respect to the value engineering proposal. Once, the Employer or the Engineer rejects the value engineering during proposition due to any reason, it shall not be pursued by Contractor in any other form.

Amendments- Employer Issuance

12.2.4.

If the value engineering proposal is acceptable to the Employer in whole or in parts, it will accept by execution of an amendment. Such amendment shall identify all the changes in the specifications, Contract Period etc, shall specify net savings on construction costs and shall provide that the Contractor be paid 30% of saved net savings amount based on the difference between the amount contained in the Contract and the estimated net savings both as determined by the Employer.

Contractor's Acceptance and Payment

12.2.5. The Contractor shall either accept or reject any proposed amendment executed by the Engineer pursuant to this section within 5 working days of its receipt date from the Employer. If the Contractor does not reject the same in the period stipulated above, the amendments shall be deemed to be accepted by the Contractor and shall become a variation to the Contract. The Contractor's acceptance shall be unconditional and compensation of 30% of the value shall constitute the full compensation. The Contractor will be paid this 30% or less but not more at the time of final payment on Engineer's certification that the net savings as intended by value engineering have been achieved.

12.3. Employer's Variations

If the Engineer requests a proposal, prior to instructing a Variation, the Contractor shall submit at his own cost within 14 days or such period as the Engineer may allow of the receipt of such request of the Engineer

a. a description of the proposed design and/or work to beperformed and a programme for its execution,

b. the Contractor's proposal for any necessary modificationsto the programme according to Sub-Clause 4. 13, and

c. the Contractor's proposal for adjustment to the ContractPrice, Time for Completion and/or modifications to the Contract.

12.5. Variation in the 12.4. Variation Procedure
Bill of Quantities approval, rejection or comments.

that case, no cost of preparing and submitting the proposal will be payable The Engineer shall, as soon as practicable after receipt of proposals under sub-clauses 12.2 and / or 12.3, respond with
to Contractor. In case, the design part of variation has been completed on submission of same to the Engineer, the Employer decides to abandon the variation, only cost for design to the extent of work done will be paid to the Contractor.

If the Engineer instructs or approves a Variation, he shall proceed in accordance with Sub-Clause 3.5 to agree or determine adjustments to the Contract Price, Time for Completion and Schedule of Payments.

After receipt of proposal, it will be the prerogative of the Employer, whether to Instruct and proceed ahead with the variation or drop the proposal in part or full. In

i. i) The quantities of items shown in the Bill of Quantities are approximate, and liable to vary during the actual execution of the work. Some items/group of items may have to be altered, added or omitted. The Contractor shall be bound to carry out and complete the stipulated work as instructed by the Engineer, irrespective of the magnitude of variations including additions, alterations or omissions in the Bill of Quantities, individual items or group of items, specified in the Bill of Quantities. ii. Such variations shall be paid as follows:

a. At the accepted rates of the Contract for Positive variationin quantities to the extent of 25%, except in the case of foundation works. Unless otherwise specifically for in the Bill of Quantities or elsewhere in the Contract, the variation of 25% shall be

applicable to a group of items mentioned therein and not to individual items. In case of variation in quantities on minus side, contract rates will be payable for executed quantities.

b. In case of foundation work, no variation limit applies andContractor shall carry out the Work, at rates stipulated in the Contract irrespective of any variation.

c. In case of earth work, the aforesaid variation limit of 25%shall apply to the gross quantity of earth work and variation in the quantity of individual classifications of soil will not be subject to this limit where any variation can take place.

d. For items against which the quantity given in the Bills ofQuantities is "if or as required", there shall be no increase/decrease of rates whatever be the quantity finally executed.

e. Variation in the quantity of items individually costing upto1% of the total contract value, shall be payable at the rates stated in the Contract. Notwithstanding the magnitude of variation upto 2% of the original Contract Value for each item.

f. In case the variation in individual items or the group of items as stipulated above, is more than 25% on plus side, the rate for the varied quantity beyond 25% shall be negotiated between the Engineer and the Contractor and mutually agreed rates arrived at before actual execution of the extra quantity.

g. In case Engineer introduces an item for which the Contractdoes not contain any rates or prices applicable to the varied Works, the rate of such items shall be derived, wherever possible, from rate for similar items available in the Bill of Quantities of the accepted Tender. In case this is not possible, the rate may be decided on the following basis:

i. Cost of Materials at current market price, as actually utilised in the final finished Permanent Works, including a reasonable percentage for wastage and transportation.

ii. Cost of enabling works if any (unless provided for separately) worked out on the above basis but with less stringent quality. Specifications minus salvage value of serviceable material released after completion of work and cost of material released as scrap.

iii. Cost of labour actually used at the site of work at rates under Payment of Minimum Wages Act for the area of work for each category of worker, further enhanced by a percentage of 10% of the aforesaid rates to account for labour not directly utilised at Site and other ancillary and incidental expenses on labour.

iv. Hire charges for Plant * Machinery, scaffolding, shuttering, forms, etc., required to be used at the site of the work. The tools used by the various trades shall not be counted as Plant & Machinery for this purpose.

v. An amount of 20% of items (i), (ii), (iii) and (iv) above to allow for Contractor's overheads, profits and corporate taxes. This percentage shall also apply to estimated cost of Materials supplied free to the Contractor. vi. In all cases where extra items of work are involved, for which there are no rates in the accepted Bill of Quantities the Contractor shall give a notice to the Engineer, of at least 7 days before the need for their execution arises.

12.6. Payment in Applicable Currencies

If the Contract provides for payment of the Contract Price in more than one currency, and an adjustment is agreed or fixed as stated above, the amount payable in each of the applicable currencies shall be specified when the adjustment is agreed or fixed. In specifying the amount in each currency, the Contractor and the Engineer (or, failing agreement, the Engineer) shall take account of the actual or expected currency proportions of the Cost of the varied work, without being bound by the proportions of various currencies specified for payment of the Contract Price.

Contractor

Contract, the Engineer may give notice to the Contractor requiring him to make good such failure and remedy the same within such time as the Employer / Engineer may deem to be reasonable.

13. Termination of the Contract

13.1. Notice to Contract Due To Contractor's Default

13.2. Termination Of

If the Contractor fails to carry out any of his obligations, or if the Contractor is not executing the Works in accordance with the

Conditions Leading To Termination Of Contract 13.2.1.

The Employer shall be entitled to terminate the Contract if the Contractor or any one of its constituents,

a. fails to comply with a notice under Sub clause 13.1

b. abandons or repudiates the Contract

c. without reasonable excuse acceptable to the Engineer failsto commence the Works in accordance with the Contract

d. sub contracts the whole of the Works or assigns the Contract without approval of the Employer

e. becomes bankrupt or insolvent or goes into liquidationexcept voluntary liquidation for the purpose of amalgamation or reconstruction

f. persistently disregards instructions of the Engineer or contravenes any provisions of the Contract, or

g. fails to adhere to the agreed programme of work by marginof 10% of the stipulated period or 21 days, whichever is earlier, or fails to complete the Works or parts of the Works within the stipulated or extended period of completion, or is unlikely to complete the whole Work or part thereof within time because of poor record of progress; or

h. fails to remove materials from the Site, or pull down andreplace work, after receiving notice from the Engineer to the effect that the said materials or Works have been condemned or rejected, or

i. fails to take steps to employ competent and/or additional staff and labour, or

j. fails to afford the Engineer or his representative proper facilities for inspecting the Works or any part thereof, or

k. indulges in corrupt or fraudulent practices as explained in Clause 4.33

13.2.2. In any one of these events or circumstances, the Employer may upon giving 14 days notice to the Contractor, terminate the Contract and expel the Contractor from the Site. However, in case of subparagraph (e) or (k), the Employer may by notice of 7 days terminate the Contract immediately.

13.2.3. For the purpose of sub para (c) above, this clause, reasonable excuse shall be one, which in the opinion of the Engineer has resulted from Circumstance which

a. is beyond the employer's or contractor's control and

b. made the failure unavoidable and it is evidenced by theContractor to the satisfaction of the Engineer that the failure was remedied without unreasonable delay once that obstacle was out of the way.

13.2.4. In case of sub para(g), the Engineer at its sole discretion may terminate only part of the contract also by taking out some part of the total scope of work and may complete or arrange for any other entity through the process of open/limited/single tender or by calling quotations, to do so at the risk and cost of the contractor.

13.2.5. The Employer's decision to terminate the Contract shall not prejudice any other rights of the Employer under the Contract.

13.2.6. On termination of contract due to contractor's default theperformance security shall be forfeited by encashing the bank guarantee and the balance work shall be got done independently without risk and cost of the failed contractor. The failed contractor shall be debarred from participating in the tender for executing the balance work. If the failed contractor is a JV or a partnership firm, then every member/partner of such JV or partnership firm shall be debarred from participating in the tender for the balance work either in his/her individual capacity or as a partner of any other JV/partnership firm.

13.2.7. The Engineer shall not make a claim under the Performance Security except for amounts to which the NMRC is entitled under the contract (Not withstanding and/or without prejudice to any other provisions in the contract agreement) in the event of:

i. Failure by the contractor to extend the validity of the Performance Security as described herein above, in which event the Engineer may claim the full amount of the Performance Security.

ii. Failure by the contractor to pay NMRC any amount due, either as agreed by the contractor or determined under any or the Clauses/Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer.

iii. The contractor being determined or rescinded under provision of the GCC the Performance Security shall be forfeited in full and shall be absolutely at the disposal of the NMRC.

Valuation at the date of Termination

13.2.8. The Engineer shall, as soon as possible after termination under Sub-Clause 13.2.1, determine and advise the Contractor of the value of the Construction and/or Manufacture Documents, Plant, Rolling Stock, Materials, Contractor's Equipment and works and all sums then due to the Contractor as at the date of termination.

Payment after Termination 13.2.9.

After termination under Sub-Clause 13.2.1, the Employer shall not be liable to make any further payments to the Contractor until the costs of design, manufacture, execution, completion and remedying of any defects, damages for delay in completion (if any), and all other costs incurred by the Employer, have been established.

The Employer shall be entitled to recover from the Contractor the extra costs, if any, of completing the Works after allowing for any sum due to the Contractor under Sub-Clause 13.2.8. If there are no such extra costs, the Employer shall pay any balance to the Contractor.

Non-exercise of power not to constitute waiver 13.2.10.

Provided always that in case any of the powers conferred upon the Employer by Sub-clause 13.1 and Sub-clause 13.2.1 above, shall have become exercisable, and the same may not have been exercised, the non-exercise thereof shall not constitute waiver of any of the conditions thereof.

13.3. Default of Employer

Notice by Contractor 13.3.1. In the event of the Employer:

a. failing to pay the Contractor, without reasonable cause, theamount due under any certificate of the Engineer within 56 days after the expiry of the time stated in Sub-Clause 11.5 within which payment has to be made, subject to any deduction that the Employer is entitled to make under the Contract, or

b. becoming bankrupt or, being a company, going intoliquidation, other than for the purpose of a scheme of reconstruction or amalgamation,

Then, the Contractor may give notice requiring the Employer to remedy the default within 28 days after receipt of the notice. If the Employer fails to remedy the default or fails to propose steps reasonably acceptable to the Contractor to do so and in that case, the Contractor may terminate the Contract after issue of 14 days notice to the Employer with a copy to the Engineer. In this case, the Contractor shall be compensated as per Sub clause 13.3.4.

The Engineer's decision on the amount payable on this account shall be final and binding.

Contractor's Entitlement to Suspend the Work 13.3.2.

The Contractor may, if the Employer fails to pay the Contractor the amount due under any certificate of the Engineer within 56 days after the expiry of the time stated in Sub-Clause 11.6, within which payment is to be made, subject to any deduction that the Employer is entitled to make under the Contract, after giving 28 days' prior notice to the Employer, with a copy to the Engineer, suspend work or reduce the rate of work.

If the Contractor suspends work or reduces the rate of work in accordance with the provisions of this Sub-Clause and thereby suffers delay or incurs

costs the Engineer shall, after due consultation with the Employer and the Contractor, determine:

a. any extension of time to which the Contractor is entitledunder sub-clause-8.4, and

b. the amount of such costs, which shall be added to theContract Price, and shall notify the Contractor accordingly, with a copy to the Employer.

Cessation of Work by Contractor

13.3.3. After termination under Sub-13.3.1, the Contractor shall:

a. cease all further work, except for such work as may benecessary and instructed by the Engineer for the purpose of making safe or protecting those parts of the Works already executed, and any Work required to leave the Site in a clean and safe condition,

b. hand over all Construction and/or Manufacture Documents,Plant, Rolling stock, and Materials for which the Contractor has received payment,

c. hand over those parts of other Works executed by the Contractor up to the date of termination, and

d. remove all Contractor's Equipment which is on the Site andrepatriate all his staff and labour from the Site.

Any such termination shall be without prejudice to any other right of the Contractor under the Contract.

Payment on Termination

13.3.4.

After termination under Sub-Clause 13.3.1 the Employer shall return the Performance security, and shall pay the Contractor an amount calculated and certified in accordance with the following conditions:

a. The value of approved materials actually brought to the siteand reasonably required to execute the works during next three months, as per approved programme, and

b. Value of work completed up to date by the contractor atrates specified in the Contract, after taking into account any deductions, retentions, set-off.

c. In addition, a sum not exceeding 2% (two percent) of thevalue of the work remaining incomplete on the date of Termination notice taking effect.

The payment as above shall be full compensation for termination under this clause and the Contractor has no claim for damages or other entitlements whether under the contract or otherwise.

13.3.5.

In case termination/foreclosure of the Contract under whatsoever circumstances, any remaining tools, plants, equipments and surplus materials of Employer with contractor will be returned to the Employer in good condition at Employer’s depot at Contractor’s cost. In case of the failure of the contractor to do so, the Employer will be entitled to recover their cost from the contractor from the amount becoming due to the contractor or from any other money due in any other contracts. The decision of the Engineer of the amount to be recovered will be final

decision and full credit at rates initially charged to the contractor shall be allowed for such materials. Similarly, the Employer shall be entitled to recover the cost of the unreturned material, plant equipment and tools from the contractor where such material have been supplied free of cost and plant, equipment and tools free of cost or on lease basis to the contractor as stipulated in the Conditions of Contract.

14. Risk and Responsibility

14.1. Indemnity The Contractor shall indemnify and hold harmless the Employer, the Engineer, the Designated Contractors, representatives and employees from and against all actions, sits, proceedings, claims, damages, losses, expenses and demands of every nature and description, by reasons of any act or omissions of the Contractor, his representative or his employees in the execution of the Works, including professional services provided by the Contractor or in the guarding the same.

These indemnification obligations shall include but not be limited to claims, damages, losses, damage proceedings, charges and expenses which are attributable to:

a. sickness, or disease, or death of, or injury to any person;and

b. loss of, or damage to, or destruction of any property (otherthan the Works) including consequential loss of use; and

c. loss, damage or costs arising from the carriage of Plant,Rolling Stock and Materials and/or ownership or chartering of marine vessels by the Contractor, or any sub-contractor of any tier.

The Contractor shall also indemnify and save harmless the Employer from and against all claims and proceedings on account of infringements of patents rights, design, trademark name etc as detailed out in clause 5.8.

All sums payable by way of compensation under these conditions shall be considered reasonable compensation payable to the Employer, without reference to the actual loss or damage sustained, and whether or not any damage shall have been sustained. The decision of the Engineer as to compensation claimed shall be final and binding.

14.2. Contractor's Care of the Works

The Contractor shall take full responsibility for the care of the Works, or any part thereof, including full responsibility for the care of any work being manufactured, or stored off-Site for inclusion in the Works, or in the course of transportation to the Site, and for the care of Contractor's Equipment, Temporary Works, Plant, Rolling Stock, and any other Material, whatsoever, on the Site or delivered to or placed on the Site in connection with, or for the purpose of the Works.

The Contractor shall take this responsibility from the Commencement Date until the date of issue of the Taking Over Certificate, when responsibility shall pass to the Employer. If the Engineer issues a Taking Over Certificate for any Section or part of the Works, the Contractor shall cease to be responsible for the care of that Section or part from the date of issue of such Taking Over Certificate when responsibility shall pass to the Employer.

The Contractor shall take responsibility for the care of any outstanding work which is required to be completed prior to the expiry of the Contract Period, until the Engineer confirms in writing that such outstanding work has been completed.

If any loss or damage happens to the Works, any other property or person, arising from any cause other than the Employer's risks listedin Sub-Clause 14.3, duringthe period for which the Contractor is responsible, the Contractor shall rectify such loss or damage, at his cost, so that the Works conform with the Contract or at the

option of the Employer, will pay or allow to the Employer the cost of rectifying such loss or damage. Notwithstanding such loss or damage, the Contractor shall proceed with the execution of works in all respects in accordance with the contract and the Engineer's instructions. The Contractor shall also be liable for any loss or damage to the Works caused by any operations carried out by the Contractor after the date of issue of the Taking Over Certificate.

14.3. Employer's Risks

The Employer's risks of loss or damage to physical property in India and of death and personal injury occurring in India in consequence of the performance of obligations under the Contract are:

a. war, hostilities (whether war be declared or not), invasion,act of foreign enemies,

b. rebellion, revolution, insurrection, or military or usurpedpower, or civil war, within India,

c. riot, commotion or disorder by persons unless solelyrestricted to or caused by employees of Contractor or of sub-contractors currently or formerly engaged in the Works,

d. Ionising radiations, or contamination by radio-activity fromany nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive nuclear assembly or nuclear component of such an assembly, except to the extent to which the Contractor may be responsible for the use of any radio-active material,

e. pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds, and

f. use or occupation by the Employer of any part of the Works, except as may be specified in the Contract.

14.4. Consequences of Employer's

If an Employer's risk results in loss or damage, the Contractor shall promptly notify the Engineer and shall rectify this loss or damage to the extent required by the Engineer.

If the Contractor suffers delay and/or incurs cost from rectifying this loss or damage, the Contractor shall give notice to the Engineer and shall be entitled to claim:

a. extension of time for any such delay, if completion is or willbe delayed, under Sub-Clause 8.4, and

b. amount of such cost, which shall be included in the Contract Price.

14.5. Contractor's Risks

The Contractor's risks are all risks other than the Employer's risks given in sub- clause14.3.

14.6. Limitation of Liability

Except as provided otherwise in these Conditions, neither party shall be liable to the other party for loss of use of any Works, loss of profit, loss of any Contract or any other indirect or consequential loss or damage which may be suffered by the other party in connection with the Contract. The total liability of the Contractor to the Employer under the Contract shall not exceed the Contract Price. Except that this Sub-Clause shall not limit the liability of the Contractor:

a. under Sub-Clauses 4.18, 4.19, 5.7, 8.6, and Clauses 7.10and 7.11

b. under any other provisions of the Contract which expresslyimpose a greater liability,

c. in cases of fraud, wilful misconduct or illegal or unlawfulacts, or

d. in cases of acts or omissions of the Contractor which arecontrary to the most elementary rules of diligence which a conscientious Contractor would have followed in similar circumstances.

15. Insurance

15.1. Professional Indemnity Insurance

The Contractor shall affect and maintain professional indemnity insurance, preferably in the name of NMRC, for the amount in Indian Rupees stipulated in Appendix to the Form of Tender in respect of any design of the Works to be carried out by, or on behalf of the Contractor. This insurance, which shall ensure the Contractor's liability by reason of professional negligence and errors in the design of the works, shall be valid from the date of commencement of Works, until 5 years after the date of issue of Performance Certificate. Alternatively, the Contractor shall redeem the insurance before the expiry of the Yearly Insurance in such a way that the entire validity period is covered.

The Engineer will not issue Final Payment Certificate until the Contractor has produced evidence that coverage of the professional indemnity insurance has been provided for the aforesaid period.

15.2. Insurance for and Works Contractor's Equipment

The Contractor shall insure the Plant, Rolling stock, Materials and Works in the joint names of the Employer, the Contractor and Subcontractors (wherever applicable) against all loss or damage. This insurance shall cover loss or damage from any cause other than the Employer's risks listed in Sub-Clause 14.3 sub paragraphs (a), (b), (d) and (e). Such insurance shall be for a limit of not less than the full replacement cost (including profit) and shall also cover the costs of demolition and removal of debris. Such insurance shall be in such a manner that the Employer and the Contractor are covered from the commencement date until the date of issue of the Taking Over Certificate for the whole of Works. The Contractor shall extend such insurance to provide cover until the date of issue of the Performance Certificate, for loss or damage for which the Contractor is liable arising from a cause occurring prior to the issue of the Taking Over Certificate, and for loss or damage occasioned by the Contractor or Sub-contractors in the course of any other operations (including Clauses 7.10, 7.11 and 10).

The Contractor shall insure the Contractor's Equipment against all risks in the joint names of the Employer, the Contractor and Subcontractors, (wherever applicable) against all loss or damage. This insurance shall cover loss or damage from any cause other than the Employer's risks listed in Sub-Clause 14.3 sub-paragraphs (a), (b), (d) and (e). Such insurance shall be for a limit of not less than the full replacement value (including delivery to Site). Such insurance shall be in such a manner that each item of equipment is insured while it is being transported to the Site and throughout the period it is on or near the Site.

15.3. Insurance against injury to and Persons Damage to Property

The Contractor shall insure against liability to third parties in the joint names of the Employer, the Contractor and Sub-contractors, (wherever applicable) for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under Sub-Clause 15.2) or to any person (except persons insured under Sub-Clause 15.4), which may arise out of the performance of the Contract and occurring before the issue of the Performance

Certificate. Such insurance shall be at least for the amount specified in the Appendix to Form of Tender.

15.4. Insurance for Workers

The Contractor shall affect and maintain insurance against losses and claims arising from the death or injury to any person employed by the Contractor or any Sub-contractor (wherever applicable) in such a manner that the Employer and the Engineer are indemnified under the policy of insurance. For Sub-contractor's employees (wherever applicable), such insurance may be affected by the Subcontractor, but the Contractor shall be responsible for compliance with this Clause.

15.5. General Requirements for Insurances

The Contractor shall, within the respective periods stated in the Appendix to Form of Tender (calculated from the Commencement Date), submit to the Employer:

a. Evidence that the insurances described in this Clause havebeen affected, with an Indian Insurance Company, and

b. Copies of the policies for the above said insurances.

When each premium has been paid, the contractor shall submit copy of receipts to the employer. The contractor shall also, when providing such evidence, policies and receipts to the employer, notify the engineer of so doing.

The contractor shall affect all insurances for which he is responsible with insurers and in terms approved by the employer. Each policy insuring against loss or damage shall provide for payments to be made in the currencies required to rectify such loss or damage. Payments received from insurers shall be used for the rectification of such loss or damage.

The contractor (and, if appropriate, the employer) shall comply with the conditions stipulated in each of the insurance policies. The contractor shall make no material alteration to the terms of any insurance without the prior approval of the employer. If an insurer makes (or purports to make) any such alteration, the contractor shall notify the employer immediately.

If the contractor fails to effect and keep in force any of the insurances required under the contract, or fails to provide satisfactory evidence, policies and receipts in accordance with this sub-clause, the employer may, without prejudice to any other right or remedy, effect insurance for the coverage relevant to such default, and pay the premiumsdue. In such cases the premium paid by the employer plus overheads (equal to 50% of the premium paid) shall be recoverable from the contractor by the employer and may be deducted by the employer from any monies due, or to become due, to the contractor or recover the same as debt due from the contractor. The contractor shall not dispute the amount of premium paid by the employer or the overhead charges thereon.

Nothing in this clause limits the obligations, liabilities or responsibilities of the contractor or the employer, under the other terms of the contract or otherwise. Any amount not insured or not recovered from the insurers shall be borne by the contractor.

The Contractor shall submit to the Engineer, the details of all claims made with the insurer and claims accepted by the insurer or any other details as required by the Engineer on monthly basis.

16. Force Majeure

16.1. Definition of Force Majeure

In this Clause, "force majeure " means an event beyond the control of the Employer and the Contractor, which makes it impossible or illegal for a party to perform, including but not limited to:

a. act of God;

b. war, hostilities (whether war be declared or not), invasion,act of foreign enemies, mobilization, requisition, or embargo;

c. rebellion, revolution, insurrection, or military or usurpedpower, or civil war;

d. contamination by radio-activity from any nuclear fuel, orfrom any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive nuclear assembly or nuclear component of such an assembly;

e. riot, commotion or disorder, unless solely restricted toemployees of the Contractor or of his Sub-contractors currently or formerly engaged on the Works.

If a party considers that it may be affected by Force Majeure, the party shall promptly notify the other party and Engineer of such Force Majeure within 21 days of such occurrence. If neither party issues any notice regarding the event within 21 days of its occurrence, the said event shall be deemed not to have occurred and the Contract shall continue to have effect as such.

16.2. Effect of Force Majeure Event

Neither the Employer nor the Contractor shall be considered in default or in contractual breach to the extent that performance of obligations is prevented by a Force Majeure event which arises after the date of Notice to Proceed Upon the occurrence of such Force Majeure, the affected party shall endeavour to continue to perform its obligations as far as reasonably practicable.

16.3. Contractor's Responsibility

If affected by such Force Majeure, the Contractor shall promptly notify the Engineer of any proposals for overcoming the consequences of the Force Majeure, including any reasonable alternative means for performance, but shall not carry out these proposals without the consent of the Engineer.

16.4. Employer's Responsibility

If affected by such Force Majeure, the Employer shall promptly notify the Engineer and the Contractor of any proposals for overcoming the consequences of the Force Majeure.

16.5. Payment to Contractor

If theWorks shall sufferloss or damage due to such Force Majeure, the Contractor shall be entitled to have included, in an Interim Payment Certificate, the Cost of work executed in accordance with the Contract.

16.6. Resumption of Work

The obligations under the Contract shall be resumed as soon as practicable after the event has come to an end or ceased to exist.

In case of doubt or dispute, whether a particular occurrence should be considered an "event" as defined under this clause, the decision of the Engineer shall be final and binding.

Works that have already been measured shall be paid for by the Employer even if the same is subsequently destroyed or damaged as a result of the event. The cost of rebuilding or replacing any work that has been measured shall be borne by the Employer.

16.7. Optional Termination, Payment and Release

Irrespective of any extension of time, if a Force Majeure occurs and its effect continues for a period of 6 months, after notice has been given under Sub-Clause 16.1, either party may give to the other party a notice of termination of the Contract which shall take effect in 28 days after the notice is given. Unless at the end of 28 days period the effect of the Force Majeure has ceased, the Contract shall terminate upon that date. Otherwise, the Contract shall remain in effect.

The Contractor shall be paid fully for the work done under the Contract, but not for any defective work or work done which has been destroyed or damaged before its measurement. The
Employer shall have the option to take over any Plant, Rolling Stock and Materials lying at site, at rates provided for in the Contract, failing that, as per rates, which are determined to be fair and reasonable by the Engineer.

16.8. Release from Performance Under the Law

If under the law of the Contract the Employer and the Contractor are released from further performance, the sum payable by the Employer to the Contractor shall be the same as would have been payable under Sub-Clause 16.7 if the Contract had been terminated under that Sub-Clause.

17. Claims, Disputes, Conciliation And Arbitration

17.1. Procedure for Claims

If the Contractor intends to claim any additional payment under any clause of these Conditions or otherwise, the Contractor shall give notice to the Engineer as soon as possible and in any event within 28 days of the start of the event giving rise to the claim.

The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at any other location acceptable to the Engineer. Without admitting the Employer's liability, the Engineer shall, on receipt of such notice, inspect such records and may instruct the Contractor to keep further contemporary records. The Contractor shall permit the Engineer to inspect all such records and shall (if instructed) submit copies to the Engineer.

Within 28 days of such notice, or such other time as may be agreed by the Engineer, the Contractor shall send to the Engineer a fully detailed claim which includes full supporting particulars of the basis of the claim and additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:

a. This fully detailed claim shall be considered as interim

b. The Contractor shall send further interim claims at monthlyintervals giving the accumulated amount of the claim and any further particulars and such further particulars as the Engineer may reasonably require; and

c. The Contractor shall send a final account within 28 days ofthe end of the effects resulting from the event

If the Contractor fails to comply with this Sub-Clause, he shall not be entitled to claim any additional payment.

17.2. Payment for Claims

The Contractor shall be entitled to have included in any Interim Payment Certificate such amount for any claim as the Engineer considers due, after taking approval from the Employer. If the particulars supplied are insufficient to substantiate the whole of the claim, the Contractor shall be entitled to payment for such part of the claim as has been substantiated.

17.3. No legal action till Dispute Settlement Procedure is exhausted

Any and all Disputes shall be settled in accordance with the provisions of Clause 17. No action at law concerning or arising out of any Dispute shall be commenced unless and until all applicable Dispute resolution procedures set out in Clause 17 shall have been finally exhausted in relation to that Dispute or any Dispute out of which that Dispute shall have arisen with which it may be or may have been connected.

17.4. Notice of Dispute

For the purpose of Sub-Clause 17.5, a Dispute shall be deemed to arise when one party serves on the other party a notice in writing (hereinafter called a "Notice of Dispute") stating the nature of the Dispute provided that no such notice shall be served later than 28 days after the date of issue of Performance Certificate by the
Engineer.

17.5. Two Stages for Dispute Resolution

Disputes shall be settled through two stages:

a. Conciliation procedures as established by "The Arbitrationand Conciliation Act-1996" (as amended from time to time) and in accordance with this Clause. In the event this procedure fails to resolve the Dispute then;

b. Arbitration procedures undertaken as provided by "TheArbitration and Conciliation Act -1996" (as amended from time to time) and in accordance with this Clause.

17.6. Conciliation

Within 60 days of receipt of Notice of Dispute, either party shall refer the matter in dispute to conciliation.

Conciliation proceedings shall be initiated within 30 days of one party inviting the other in writing to Conciliation. Conciliation shall commence when the other party accepts in writing this invitation. If the invitation is not accepted then Conciliation shall not take place. If the party initiating conciliation does not receive a reply within 30 days from the date on which he sends the invitation he may elect to treat this as a rejection of the invitation to conciliate and inform the other party accordingly.

The Conciliation shall be undertaken by one Conciliator selected from a panel of Conciliators maintained by the Employer. The Conciliator shall assist the parties to reach an amicable settlement in an independent and impartial manner.

17.7. Conciliation Procedure

The Employer shall maintain a panel of Conciliators with requisite qualifications and professional experience who shall be from serving or retired engineers of Government Departments, or of Public Sector Undertakings. Out of this panel, a list of three Conciliators shall be sent to the Contractor who shall choose one of them to act as Conciliator and conduct conciliation proceedings in accordance with "The Arbitration and Conciliation Act, 1996", of India. The party serving notice of dispute on the other party shall also serve such notice on the Conciliator chosen as per this Clause. The Employer at the time of offering the panel of Conciliator(s) to be appointed as Conciliator shall also supply the information with regard to the qualifications of the said Conciliator nominated in the panel along with their professional experience, phone nos. and addresses to the contractor.
The Employer and the Contractor shall in good faith co-operate with the Conciliator and, in particular, shall endeavour to comply with requests by the Conciliator to submit written materials, provide evidence and attend meetings. Each party may, on his own initiative or at the invitation of the Conciliator, submit to the Conciliator suggestions for the settlement of the dispute.

When it appears to the Conciliator that there exist elements of a settlement which may be acceptable to the parties, he shall formulate the terms of a possible settlement and submit them to the parties for their observations. After receiving the observations of the parties, the Conciliator may reformulate the terms of a possible settlement in the light of such observations.

If the parties reach agreement on a settlement of the dispute, they may draw up and sign a written settlement agreement. If requested by the

parties, the Conciliator may draw up, or assist the parties in drawing up, the settlement agreement.

When the parties sign the settlement agreement, it shall be final and binding on the parties and persons claiming under them respectively.

The Conciliator shall authenticate the settlement agreement and furnish a copy thereof to each of the parties

As far as possible, the conciliation proceedings should be completed within 60 days of the receipt of notice by the Conciliator.

The parties shall not initiate, during the conciliation proceedings, any arbitral or judicial proceedings in respect of a dispute that is the subject matter of the conciliation proceedings.

17.8. Termination of Conciliation Proceedings

The conciliation proceedings shall be terminated:

a. by the signing of the settlement agreement by the partieson the date of agreement; or

b. by written declaration of the conciliator, after consultationwith the parties, to the effect further efforts at conciliation are no longer justified, on the date of declaration; or

c. by a written declaration of the parties to the conciliator tothe effect that the conciliation proceedings are terminated, on the date of declaration; or

d. by a written declaration of a party to the other party and theconciliator, if appointed, to the effect that the conciliation proceedings are terminated, on the date of declaration.

Upon termination of the conciliation proceedings, the conciliator shall fix the costs of the conciliation and give written notice thereof to the parties. The costs shall be borne equally by the parties unless settlement agreement provides for a different apportionment. All other expenses incurred by a party shall be borne by that party.

17.9. Arbitration

If the efforts to resolve all or any of the disputes through conciliation fails, then such disputes or differences, whatsoever arising between the parties, arising out of touching or relating to construction/ manufacture, measuring operation or effect of the Contract or the breach thereof shall be referred to Arbitration in accordance with the following provisions:

a. Matters to be arbitrated upon shall be referred to a soleArbitrator if the total value of the claim is up to Rs.50 lakh and to a panel of three Arbitrators if total value of claims is more than Rs.50 lakh.

b. NMRC shall provide a panel of three Arbitrators for theclaims up to Rs.50 Lakh and a panel of five Arbitrators for claims of more than Rs.50 Lakh which may also include NMRC officers. The Contractor shall have to choose the sole Arbitrator from the panel of three and / or one Arbitrator from the panel of five in case three Arbitrators are

to be appointed. NMRC shall also choose one Arbitrator from this panel of five and the two so chosen will choose the third Arbitrator from the panel only as the presiding arbitrator. The Arbitrator(s) shall be appointed within a period of 30 days from date of receipt of written notice / demand of appointment of

Arbitrator from either party. Neither party shall be limited in the proceedings before such arbitrator(s) to the evidence or arguments put before the Engineer for the purpose fo obtaining his decision. No decision given by the Engineer in accordance with the foregoing provisions shall disqualify him from being call as a witness and giving evidence before the arbitrator(s) on any matter whatsoever, relevant to dispute or difference referred to the arbitrators. The arbitration proceedings shall be held in Noida only. The language of the proceedings, that of documents and communication shall be English.

c. The Employer at the time of offering the panel of Arbitrator(s) to be appointed as Arbitrator shall also supply the Information with regard to the qualifications of the said Arbitrator nominated in the panel along with their professional experience, phone nos. and addresses to the Contractor.

d. The Arbitration Proceedings shall be governed by IndianArbitration and Conciliation Act 1996, as amended from time to time including provisions in force at the time the references made. During the pendency of arbitration proceedings, the Contractor shall continue to perform and make due payments to NMRC as per the Contract Agreement

e. The award of the sole Arbitrator or the award by majority ofthree Arbitrators as the case may be shall be binding on all parties.

17.10. Interest on Arbitration Award

Where the arbitral award is for the payment of money, no interest shall be payable on whole or any part of the money for any period, till the date on which the award is made.

17.11. Cost of Arbitration

The cost of arbitration shall be borne by the respective parties. The cost shall, inter alia, include the fees of the Arbitrator(s) as per rates fixed by the Employer from time to time.

17.12. Jurisdiction of Courts

With respect to any dispute arising out of or related to this Contract, the parties consent to the exclusive jurisdiction of, and venue in, the District Court located in Gautam Budh Nagar, Uttar Pradesh, India

17.13. Suspension of Work on Account of Arbitration

The reference to Conciliation / Arbitration shall proceed not withstanding that the Works shall not then be or be alleged to be complete, provided always that the obligations of the Employer, Engineer and the Contractor shall not be altered by reasons of arbitration being conducted during the progress of the Works. Neither party shall be entitled to suspend the work or part of the work to which the dispute relates on account of arbitration and
payments to the Contractor shall continue to be made in terms of the Contract.

18. Service of Notices

18.1. Notice to Contractor

a. All notices to the Contractor, shall be served by post or telex or telefax or by hand to the Contractor or his authorized representatives. In case of notices delivered by post, they will be deemed to have been delivered after 7 days of dispatch.

b. The Contractor shall, on award of the Contract, furnish to the Engineer, the name, designation, address and telephone, telex and telefax numbers and e-mail address of his representative referred to in Clause 4.3.

18.2. Notice to Employer and Engineer

All notices to the Employer or Engineer shall be served by post or telex or telefax, or by delivering by hand to the address nominated for the purpose.

18.3. Change of Address

Parties to the Contract may change the nominated address by Employer with a notice to all concerned.

NOIDA METRO RAIL CORPORATION LTD.

(A joint venture of Govt. of India and Govt. of U.P.)

CONDITIONS OF CONTRACT ON
SAFETY, HEALTH AND ENVIRONMENT MANAGEMENT
(July 2018)

NOIDA METRO RAIL CORPORATION LTD.
Block – III, 3rd Floor, Ganga Shopping Complex,
Sector-29, Noida – 201 301,
District Gautam Budh Nagar, Uttar Pradesh, India

Content

Part – I: Safety Health & Environment Management

1. General

1.1. Scope

This document defines the principal requirements of the Employer on Safety, Health & Environment associated with the contracts to be practiced in Housekeeping works of O&M wing.

1.2. Definition / languages

In this document:

a. The use of 'shall' indicates a mandatory requirement.

b. The use of 'should' indicates a guideline that is stronglyrecommended.

c. The use of 'may' indicates a guideline that is to be considered.

d. 'S & H' means Safety and Health.

e. Employer means Noida Metro Rail Corporation Ltd., (NMRC).

f. BOCWA means Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996

g. BOCWR means Building and Other Construction Workers(Regulation of Employment and Conditions of Service) Central Rules, 1998

h. DG means Director General of Ministry of Labour, Govt. of India

i. CIIBC means Chief Inspector of Inspection of Building and Other construction

1.3. Application of This document applies to all aspects of the contractor's scope of work, this document including all aspects conducted by sub-contractors and all other agencies. There shall be no activity associated to the contract, which is exempted from the purview of this document.

1.4. Purpose of this document The objective of these guidelines is to ensure that adequate precautions are taken to avoid accidents, occupational illness and harmful effects on the environment during housekeeping work.

2. 'SHE' Targets and Goals

The SHE targets, goals and aim for the Works are to achieve:

a. Zero total recordable injuries.

b. Zero reportable environmental incidents

c. All personnel inducted in accordance with the approvedcontractor SHE plan.

d. Total compliance of conducting inspections and audits as perapproved SHE plan

e. 100% incident recording and reporting

f. 100% adherence of usage of appropriate PPEs at work.

g. Executing housekeeping work with least disturbance to theenvironment, adjoining road users and traffic

3. Compliance

3.1. NMRC's Safety and Health Management Systems

The Housekeeping works shall be undertaken in accordance with NMRC's Safety and Health Policy and Management Systems as amended from time to time provided in Safety and Health Manual.

3.2. Indian statutory Contractor shall develop thorough understanding about Building and requirements Other construction Workers (Regulation of Employment and Conditions of Service) Act 1996, Central Rules 1998, Building and Other construction workers Welfare Cess Act, 1996 and Central Rules, 1998 and Uttar Pradesh Building Workers' Welfare Board Rules, not only to satisfy the Inspectors' perspective but the use of legislation as the strong tool for effective SHE management at work place work places. Contractor is strongly advised to practice the principle of voluntary compliance.

4. ID Card and Identity card to each housekeeping staff shall be issued by the Chief first day at Security Commissioner office of NMRC on payment of requisite fee for police verification and cost of card. The contractor should submit work; SHE application for this in the prescribed format clearly providing basic details orientation affixing photographs and finger prints of the concerned staff. In the training absence of valid identity card, the housekeeping staff shall not be permitted to enter into the station premises.

The Contractor shall ensure that all personnel working at the housekeeping work places receive an induction Safety and Health training explaining the nature of the work, the hazards that may be encountered during the work place work and the particular hazards attached to their own function within the operation.

5. Safety and Team leader, Manager and supervisors employed for cleaning and Health housekeeping works should be trained and certified by BICS (British Institute of Cleaning Science, Gurgaon) or Forbes Pro Academy of Training Eureka Forbes. They shall in turn train their other Housekeeping Personnel under them. Certificate of training of Team Leader, Manager and Supervisor should be produced before start of work.

On-the spot practical skill development training on height safety shall also be conducted to all foremen/ workmen who were associated to the concerned jobs.

6. Safety and The contractor shall prepare required inspection checklist for all activity Health operations and equipment. Checklists will be prepared based on the Indian standards, rules and regulations and Employer's requirements. Inspection

All records will be properly kept and filed for record purpose.

7. Safety The contractor shall take every effort to communicate the Safety and Communicati Occupational health management measures through posters campaigns /billboards /banners /glow signs being displayed around the on housekeeping work places as part of the effort to raise safety awareness amongst the work force. Posters should be in Hindi, English and other suitable language as deemed appropriate.

8. Accident reporting and investigation

8.1. Reporting to All accidents and dangerous occurrences shall immediately be informed Employer verbally to the employer. Reports of all accidents (fatal / injury) and dangerous occurrences shall also be sent within 24 hours as per format provided.

No accident/ dangerous occurrence is exempted from reporting to the employer. Any wilful delay in verbal and written reporting to the Employer shall be penalised.

8.2. Reporting to In addition to the above verbal and written reporting to the Employer, a Govt. notice of any accident to a worker at the building or work place that organisations causes loss of life; or disables a worker from working for a period of 48 hours or more immediately following the accident;

shall forthwith be sent by telephone, fax, email or similar other means including special messenger within 24 hours in case of fatal accidents and not later than 72 hours in case of other accidents to:

a. Regional Labour Commissioner (central), wherein the contractor has registered the firm/work

b. the board with which the worker involved was registered as abeneficiary;

c. Director General and

d. the next of kin or other relative of the worker involved in theaccident;

8.3. Notice of Accident — Further, notice of accident shall be sent in respect of an accident which causes loss of life; or disables the injured worker from work for more 10 days to

a. the officer-in-charge of the nearest police station;

b. the District Magistrate or, if the District Magistrate by order sodesires, to

c. the Sub-Divisional Magistrate

8.4. Notice of death Where any accident causing disablement that subsequently results in death, notice in writing of such death, shall be sent to the authorities mentioned above as soon as possible within 24 hrs and maximum 72 hours of such death.

8.5. Reporting of dangerous occurrences — All cases of dangerous occurrences shall be reported to the Inspector having jurisdiction, whether or not any disablement or death caused to the worker. The same shall also be immediately reported to the employer.

8.6. Accident Investigations should be conducted in an open and positive atmosphere investigation that encourages the witnesses to talk freely. The primary objective is to ascertain the facts with a view to prevent future and possibly more serious occurrences.

8.7. Employers' incident investigation — In case of fatal / dangerous occurrence the Employer shall also conduct independent independent investigation. Contractor and his staff shall extend necessary co-operation and testify about the accident.

9. Emergency preparedness plan

9.1. The Contractor shall prepare an Emergency Response Plan for all work places. Arrangements shall be made for emergency medical treatment and evacuation of the victim in the event of an accident or dangerous incident occurring, the chain of command and the responsible persons of the contractor with their telephone numbers and addresses for quick communication shall be adequately publicized and conspicuously displayed in the workplace.

9.2. Contractors shall require to tie-up with the hospitals located in the neighbourhood for attending to the casualties promptly.

9.3. Contractor shall participate in on-work-place emergency mock drill for all his housekeeping staff along with Mock drill being conducted by NMRC.

Part – II: Safety

10. Housekeeping a. Contractor shall understand and accept that improper housekeeping is the primary hazard in any work place and ensure that a high degree of housekeeping is always maintained.

b. General Housekeeping shall be carried out by the contractor and ensuredat all times at Work place, Stores and Offices.

c. All stairways, passageways and gangways shall be maintained withoutany blockages or obstructions. All emergency exits passageways, exits fire doors, break glass alarm points, firefighting equipment, first aid stations, and other emergency stations shall be kept clean, unobstructed and in good working order.

d. Water logging on work places shall not be allowed.

e. Proper and safe stacking of material needs to be ensured.

f. All wooden scrap and other combustible packing materials shall be removed from work place to identified location(s).

Do's and Don'ts for Housekeeping Staff

Do's

i. In case of fire / anything unusual on electric traction equipment or wires, inform the station controller/Manager.
ii. Extinguish fire by special extinguishers (carbon tetrachloride or carbon dioxide type, if available.
iii. Ensure no water jet to be directed at the fire under any circumstances.
iv. Before taking up the work on a line running parallel to 25 KV AC lines, the line shall be earthed on both sides. Ensure that the distance between the two earths used for protection does not exceed 1km.
v. Keep clear of the track and avoid contact with the rails when electric train within 250m.
vi. Special care should be taken to carry long pipes, poles or ladders so that it should not come in contact with or within 2 meters of live OHE.
vii. Cleaning work other than that of surface (i.e. of beam, pillars etc.) should be done during block period only.
viii. Whenever washing or cleaning using water jets is done, take appropriate power block.
ix. Cases of electric shock arising out of contact with 25 KV A.C traction equipment shall be reported immediately to TPC.

Don'ts

i. Do not approach within 2 meters of any traction wires or live EHV equipment.
ii. Do not work on or near traction wires or any live equipment unless they are made dead, earthed and shut down notices/ permit to work obtained.
iii. Do not enter any switching station or remote control centre unless specially permitted.
iv. Do not touch a person in contact with live traction wires. Remove body only after power supply is switched off & earthed.
v. Do not touch any traction wire hanging from the mast or fallen on the ground and do not allow anyone else to touch it.
vi. Cleaning work with conducting materials like Aluminum/ Steel rods should be avoided at all times when power block is not availed.
vii. Do not lift or raise your tools towards traction wires.
viii. Do not damage the plinth continuity, connection to BEC, OPC and handrail continuity.

ix. Do not use steel tape or metallic tape or tape with woven metal reinforcement in electrified area.

x. Do not forget to give artificial respiration to the victim as per the prescribed procedure laid down at shock treatment charts.

xi. Metallic telescopic rods are prohibited for use in the NMRC station. xii. Do not throw garbage in haste. Dispose it properly at designated place.

11. Working at Height

The contractor shall ensure that work at height is

a. properly planned for any emergencies and rescue

b. appropriately supervised; and

c. carried out in a manner, which is reasonably practicable safe.

11.1. Falling objects

a. The contractor shall, where necessary to prevent injury to any person, takesuitable and sufficient steps to prevent, so far as is reasonably practicable, the fall of any material or object.

b. Every contractor shall take suitable and sufficient steps to prevent anyperson being struck by any falling material or object which is liable to cause personal injury.

c. The contractor shall ensure that no material or object is thrown or tippedfrom height in circumstances where it is liable to cause injury to any person.

d. Every contractor shall ensure that, every workplace where chances of fallof material or other risk exist, shall be properly barricaded or provided with suitable safety net as fall catch arrestors etc.

11.2. Danger areas

Every contractor shall ensure that

a. where a workplace contains an area in which, owing to the nature of the work, there is a risk of any person at work
   i. falling a distance; or
   ii. being struck by a falling object

which is liable to cause personal injury, the workplace be so far as is reasonably practicable, equipped with devices preventing unauthorised persons from entering such area; and such area is clearly indicated

11.3. Inspection of work equipment

The contractor shall ensure that, all work equipment used at work place and exposed to conditions causing deterioration shall be inspected regularly and recorded.

11.4. Requirements for all Working Platforms

Every contractor shall ensure that whenever necessary proper, safe and adequate to the working requirement, working platforms is provided.

11.5. Requirements for fall protection

Every contractor shall ensure that fall protection measures are provided for safe means of access as well as safe working

11.6. Requirements for Ladders

Every contractor shall ensure that a ladder is used for work at height only if a risk assessment has demonstrated that the use of more suitable work equipment is not justified because of the low risk.

a. Only metal ladders shall be allowed. Bamboo ladders are prohibited

b. Any surface upon which a ladder rests shall be stable, firm, of sufficientstrength and of suitable composition safely to support the ladder so that its rungs or steps remain horizontal, and any loading intended to be placed on it.

c. A ladder shall be so positioned as to ensure its stability during use.

d. A portable ladder shall be prevented from slipping during use by –

e. a. securing the stiles at or near their upper or lower ends;

f. b. an effective anti-slip or other effective stability device; or

g. c. any other arrangement of equivalent effectiveness

h. A ladder used for access shall be long enough to protrude sufficientlyabove the place of landing to which it provides access unless other measures have been taken to ensure a firm handhold.

i. No interlocking or extension ladder shall be used unless its sections are prevented from moving relative to each other while in use.

j. A mobile ladder shall be prevented from moving before it is stepped on.

k. Where a ladder or run of ladders raises a vertical distance of 9 metres ormore above its base, there shall, where reasonably practicable, be provided at suitable intervals sufficient safe landing areas or rest platforms.

l. Every ladder shall be used in such a way that
   i. a secure handhold and secure support are always available to theuser; and
   ii. the user can maintain a safe handhold when carrying a load unless,in the case of a step ladder, the maintenance of a handhold is not practicable when a load is carried, and a risk assessment has demonstrated that the use of a stepladder is justified because of
   iii. the low risk; andiv. the short duration of use.

12. Slipping, Tripping, Cutting and Falling Hazards

a. All places should be free from dust, debris or similar materials. Sharpprojections or any protruding nails or similar objects shall be suitably guarded or shall even be avoided to make the place safe to work.

b. Open side or opening where worker, equipment, vehicle or lifting appliancemay fall at a building or outside shall be guarded suitably except in places of free access by reasons of nature of work.

c. Suitable safety net shall be provided at places of material / man falling ispossible in accordance with national standards.

13. Work place machinery

Every work place equipment shall be in sound mechanical working condition and certified by either competent person under Factories Act or manufacturers' warranty in case of brand new equipments or authorized persons / firms approved by Employer before induction to any work place.

14. Machine and General Area Guarding

The contractor shall ensure at the work place all dangerous and moving parts of housekeeping machines are securely fenced or legged. The fencing of dangerous part of machinery is not removed while such machinery is in motion or in use.

15. Manual lifting and carrying of excessive weight

The contractor shall ensure at his work place no housekeeping staff lifts by hand or carries overhead or over his back or shoulders any material, article, tool or appliances exceeding in weight as said below, unless aided by another housekeeping staff or device.

Person	Maximum weight in kg
Adult man	55
Adult woman	30

16. Work place Electricity

a. Every contractor shall ensure safe usage practices of power supply as wellas safe electrical equipments fitted with protection devices.

b. Cables shall be selected after full consideration of the condition to whichthey shall be exposed and the duties for which they are required.

c. The contractor shall ensure plugs, socket-outlets, and couplers available inthe work place as per IS/applicable standard.

d. Every joint and connection in a system shall be mechanically andelectrically suitable for use to prevent danger. Proper cable connectors as per standards shall only be used to connect cables.

e. No loose connections or tapped joints shall be allowed anywhere in thework place, office area, stores and other areas.

17. Work on or near live conductors

a. For working near OHE & other Electrical installation, the rules/measuresprovided in the Safety Circular – 2 of O&M wing shall be followed.

b. No person shall be engaged in any work activity on or so near any liveconductor (other than one suitably covered with insulating material so as to prevent danger) that danger may arise unless-

c. a. Suitable precautions (including where necessary the provision ofsuitable protective equipment) are taken to prevent injury.

17.1. Inspection and Maintenance

All electrical equipment should be permanently numbered and a record kept of the date of issue, date of last inspection and recommended inspection period.

18. Hand Tools and Power Tools

a. The contractor is wholly responsible for the safe condition of Housekeeping plant and equipment used by his employees and that of his subcontractors.

b. Use of short / damaged hand tools shall be avoided and the contractorshall ensure all his hand tools used at his work place are safe to work with or stored and shall also train his employees (including his sub-contractors) for proper use thereby.

c. All hand tools and power tools shall be duly inspected before use for safeoperation.

d. The contractor shall ensure that power tools (electric) are properlygrounded or / and double insulated.

19. Fire prevention, protection and fighting system

a. The contractor shall ensure that storage area is provided with fire extinguishing equipment sufficient to extinguish any small fire at work place.

b. Recharging of fire extinguishers and their proper maintenance should be ensured and as a minimum should meet Indian National Standards.

c. Combustible scrap and other work place debris should be disposed off on a regular basis.

20. Corrosive substances Corrosive substances including alkalis and acids shall be stored and used by a person dealing with such substances at a building / work place in a manner that it does not endanger the worker and suitable PPE shall be provided by the contractor to the worker during such handling and work. In case of spillage of such substances on worker, the contractor shall take immediate remedial measures.

21. Work Permit system

The Contractor's site staff shall abide by Work Permit system of NMRC, used to control certain types of work that are potentially hazardous.

A permit is needed when work place work can only be carried out if normal safeguards are dropped or when new hazards are introduced by the work. Examples of high-risk activities include but are not limited to:

a. Entry into confined spaces

b. Work in close proximity to overhead power lines and telecommunicationcables.

c. Work with electrical equipment and operations closer to live power line.

d. Working on track & operation rooms.

A Work Permit authorisation form shall be completed with the maximum duration period not exceeding one shift.

A copy of each Permit to Work shall be displayed, during its validity, in a conspicuous location in close proximity to the actual works location to which it applies.

22. Work to adjacent track Whenever work is to be conducted in close proximity to the live track then the following measures shall need to be addressed:

a. The rules/measures provided in the Safety Circular – 2 of O&M manualshall be followed.

b. No persons are allowed to work onto the track unless specific authority hasbeen given by NMRC. Adequate protection in accordance with the O&M requirements shall be followed.

c. All persons shall wear high visibility clothing at all times.

d. Any induction training requirements of the Track shall be strictly observed.

23. Personal Protective Equipment (PPEs) safety and / or health hazards. Primarily PPEs are required for the following protection:

a. A. Height Work
   i. Safety Helmet
   ii. Full body Safety harness

b. B. Electrical Operation Room
   i. Shoes with insulated sole/Rubber Gum boots
   ii. Electrically insulated Gloves

c. C. Chemical Handling
   i. Eye protection i.e. Safety goggles ii. Chemical Gloves for hand protection

Part – III: Occupational Health and Welfare

24. Physicalfitness of workmen

The contractor shall ensure that his employees/workmen subject themselves to such medical examination as required under the law or under the contract provision and keep a record of the same.

25. Medical Facilities

The contractor shall not permit any employee/workmen to enter the work area under the influence of alcohol or any drugs.

25.1. Medical Examination

As per BOCW relevant rules, the contractor shall arrange a medical examination of all his employees including his sub-contractor employees employed before employing, after illness or injury, if it appears that the illness or injury might have affected his fitness.

25.2. Ambulance van

The contractor shall ensure that an arrangement is made with a nearby hospital for providing such ambulance van for transportation of serious cases of accident or sickness of workers to hospital promptly.

25.3. First-aid boxes

The contractor shall ensure at a work place one First-aid box provided and maintained for providing First-aid to the workers. Every First-aid box is distinctly marked “First aid” and is equipped with the articles specified in
BOCWR.

26. Welfare measures for workers

26.1. Toilets and Urinals

Generally, facilities are available at Metro Station, Depots & other work places and maintained by agencies engaged by NMRC. Contractors workers may utilised these facilities on payment basis.

26.2. Drinking water

As per relevant section of BOCWA the contractor shall make in every work place, effective arrangements to provide sufficient supply of wholesome drinking water with minimum quantity of 5 litres per workman per day. Quality of the drinking water shall conform to the requirements of national standards on Public Health.

Part – IV: Penalty and Awards

27. Charges to be recovered from contractor for unsafe act or condition

NMRC has built an image of safety conscious organisation meticulously over a long period of operation. Any reportable accident (fatality / injury) results in loss of life and/or property damage. These accidents not only result in loss of life but also damage the reputation of NMRC. Most of the accidents are avoidable and caused preliminary due to contractors’ negligence. Hence NMRC shall recover the cost of damages from the contractors for every reportable incident
(fatality / injury).

In addition, sometimes our activities are exposed to public scrutiny as the work is executed on public places. Any unsafe act / unsafe condition observed by public further damage our reputation. Without limiting to the unsafe acts and or conditions, the Employer shall have the right to deduct charges for any other unsafe act and or condition depending upon the gravity of the situation on a case-to-case basis.

28. Stoppage of unsafe activity by contractor

a. The Employer shall have the right to stop the work at his sole discretion, ifin his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and / or property, and / or equipment at specific work place.

b. The contractor shall not proceed with the work until he has complied witheach direction to the satisfaction of Employer.

c. The Contractor shall not be entitled for any damages / compensation forstoppage of work, due to safety reasons.

29. Awards

The following categories will be considered for awards as per the scheme in practice of Employer

a. Zero fatality contracts.

b. 100% adherence to voluntary reporting of all accidents throughout thecurrency of contract.

c. Safest Contractor of the year.

Part – V: Environment Management

30. Indian statutory requirements

The Housekeeping works shall be undertaken in accordance with all applicable legislation and Indian statutory requirements listed below but not limiting to:

a. Environment Protection Act, 1986 and Rules 1986

b. Air (Prevention and control of Pollution) Act, 1981

c. Water (Prevention and Control of Pollution) Act, 1974

d. The Noise Pollution (Regulation & Control) Rules, 2000

e. Notification on Control of Noise from Diesel Generator (DG) sets, 2002

f. Solid Waste Management Rules, 2016

g. Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016

h. e-waste (Management) Rules, 2016

i. Batteries (Management & Handling) Rules, 2001 and amendment 2010

j. Plastic Waste Management Rules, 2016

k. Bio-Medical Waste Management Rules, 2016

31. Procurement of materials

Cleaning products shall be bio-based, non-toxic, fragrance free, have a pH between 4 and 9, and have low levels of volatile organic compounds (VOCs). Products may not contain: carcinogens, mutagens, teratogens, ozonedepleting compounds, greenhouse gasses, dyes, petroleum distillates, endocrine modifiers, alkyl phenyl ethoxylates, dibutyl phthalate, heavy metals, more than 0.5% phosphorous, chlorinated solvents, or contribute to petrochemical smog or poor indoor air quality.

In addition, concentrated products are used and properly diluted to reduce impacts to human health and the environment.

Re-usable/washable rags and mops should be used, which are effective and do not shed fibers.

Products used should degrade rapidly, should not harm human health, should not pollute the air or water supply, and should present an economically sound cost of usage.

32. Waste Management

Collection, handling, segregation, transportation and disposal of waste may cause environmental degradation and nuisance. To prevent it, waste has to be handled and disposed properly. As such, collection, handling, segregation, transportation and disposal of all waste shall be strictly managed by the contractor.

Training of staff should be undertaken by the contractor in order to increase awareness of waste management issues.

Information regarding waste segregation shall be posted at appropriate locations around the office.

The contractor shall ensure regular maintenance and cleaning of the waste storage areas.

No lubricants and hazardous waste shall be allowed to discharge into water courses. Burning of any type of waste and illegal dumping of waste is strictly prohibited.

33. Collection The contractor shall provide sufficient number of bins to collect the waste items. Hazardous waste, used batteries, bio-medical waste, recyclable paper waste, biodegradable and general refuse shall be collected in separate bins to ensure 100% segregation at source itself.

The collection bins shall be as per applicable legal requirement. All waste collections bins shall be of appropriate size with a closed lid. Each bin shall be clearly labelled both with colour code system and labelled in Hindi and English.

Bio-medical waste shall be collected on daily basis.

34. Segregation The contractor shall collect general refuse on daily basis and shall be segregated into bio-degradable and recyclable. These wastes should be disposed on daily basis through local municipal agency.

35. Storage and disposal Mechanism

The contractor shall take all necessary permits or fulfil all necessary legal requirements for storage of all waste items.

Hazardous waste and batteries shall be stored on an impermeable surface with containment bunding to retain leaks, spills and ruptures.

Storage period and disposal mechanism for different waste stream is tabulated below:

S. No.	Waste Stream	Maximum storage period at site	Disposal Mechanism
1.	General Refuse	48 hours	Through Municipal agency
2.	Recyclable paper waste	3 months	Through paper recycling agency appointed by the Employer
3.	Bio-Medical Waste	48 hours	Authorised agency appointed by the employer
4.	Used Batteries	As per law	Authorised agency appointed by the employer
5.	Hazardous Waste	As per law	Authorised agency appointed by the employer

6.	e-Waste	As per law	Authorised agency appointed by the employer

Appendix– 1: Topics for First Day at Work SHE Orientation Training of Workmen

36. Hazard Identification Procedure	Hazards on work place: a. Electricity b. Machinery c. Handling materials d. Work place housekeeping e. Work at Height f. Fire
37. Personal Protective Equipment	a. What is available? b. How to obtain it? c. Correct use and care.
38. Health	a. Work place welfare facilities b. Potential health hazards c. First Aid/CPR
39. Duties of the contractor	a. Brief outline of the responsibilities of the Contractor by law b. Details of Contractor's accident prevention policy c. Building and other construction worker Welfare Law
40. Employee's Duties	d. Brief outline of responsibilities of employee under law e. Explanation of how new employees fit into the Contractor's plan foraccident prevention. (induction and orientation).

Appendix – 2: ID Card Format

Dimensions (85 mm x 55 mm)

Front Side of ID Card

Noida – Greater Noida Metro Corridor Project			
Company logo		Name	
		Address	
	Photo	Designation	

	Signature:		Blood group	
			Valid up to	

Reverse Side of ID Card

Noida – Greater Noida Metro Corridor Project	
Employee Address	
This card is the property of "xx" (Main/Sub/labour Contractor) and must be returned on demand and on transfer/cancellation of employment. A charge will be levied for replacement of the card due to loss or theft. If found please return to the address given below.	
Main Contractor Address	

Appendix – 3: Safety and Health Posters

Every contractor shall prepare a SHE Communication Plan as a part of work place specific SHE Plan and shall include the following minimum requirement of Posters / Signages / Video as applicable. In case readymade posters are available in any of the category from safety related organisations, they may procure the same and display it. In case the same is not available then the contractors shall make necessary arrangements to get the posters designed and printed on their own. The List of Posters: a. Mandatory PPE Usage

b. Working at Height

c. Work place Electricity

d. First Aid

Appendix – 4: Sample Accident Occurrence Form

NMRCL	Safety Form Reference			Form no:	SAF - 01
Accident/ Dangerous Occurrence Form				Accident no:	
Name of the Contractor				Contract no:	
Instructions: 1. A copy of this form shall be completed for every Accident or Dangerous Occurrence 2. It must be signed by a senior work place management representative 3. A copy shall be sent to the Employers Representative within 24 hours of the Accident					
Part A – Details of Injured Person					
Name		DOB		Gender	
Address					
Job title		Employer			
Part B – Details of the Accident					
Date		Time		Location	
Describe the task the injured person was doing at the time of the accident:					
Describe in detail how the accident happened: (Attach any sketch, picture, map etc. if required)					
Plant and Machinery involved:	Yes/No	If yes, describe			
Witnesses (if any)					
Part C – Details of the injury					
Injury description					
Injury Category:		Response to injury		Home	
Fatal		First Aid			

Major		Doctor				
Minor		Hospital				
Part D - Certification						
I have checked the above information and can confirm that it is a true record of the accident						
Signed		In-charge name		Date		