

KOTA SMART CITY LIMITED

(An initiative of GoI, GoR & ULB)

NATIONAL COMPETITIVE BIDDING



Notice Inviting Online Bids For Development of Dussehra Maiden (Phase-I) Kota (NCB)

NIB No. 01/2016-17

Bidding Document For

Development of Dussehra Maiden(Phase - I) Kota with Civil, Electrical, Plumbing, Architectural and Landscaping work including 1 year defect liability and there after 03 years O&M

Bid Cost : Rs. 6426.70 Lacs

December - 2016

Address :- KOTA SMART CITY LIMITED Kota (Rajasthan)

Rajeev Gandhi Bhawan Dussehra Ground Kota

Ph:- 0744-2500197,

E-mail:- nnkota@gmail.com

KOTA SMART CITY LIMITED
(An initiative of GoI, GoR & ULB)

Kota Municipal Corporation,
Rajeev Gandhi Bhawan,
Dussehra Maidan, Kota, Rajasthan, 324007



CIN: U75232RJ2016SGC056440

Tel: 0744-2502293 | Fax: 0744-2501282

E-mail : ksclkota@gmail.com
nnkota@gmail.com

No :-

Date :

Short term NIB No. 01/2016-17

Notice inviting on line bids for Development of Dussehra Maiden Work under Phase-I (NCB)

KOTA SMART CITY LIMITED Kota invites online unconditional bids on behalf of the Governor of Rajasthan through e-procurement portal <http://eproc.rajasthan.gov.in> from eligible bidders in accordance with the RTPP Act 2012 and RTPP Rules 2013, amended upto date and under national Competitive Bidding with Single Stage - two envelope Bidding procedure for following works.

S. No	Name of Work	Estimated Cost (Rs. In Lacs)	Earnest Money (Rs. In Lacs)	Tender Fee	Period of completion
				Processing Fee pay to M.D. RISL, Jaipur	
1	Development of Dussehra Maiden(Phase-I) Kota with Civil, Electrical, Plumbing, Architectural and Landscaping work including 1 year defect liability and there after 03 years O&M	6426.70	128.54	20,000/- 1,000/- Processing Fee	12 Months

1. Detailed NIT & Bid Documents can be seen at the websites sppp.raj.nic.in & <http://eproc.rajasthan.gov.in> and may be downloaded free of cost from <http://eproc.rajasthan.gov.in>
2. Any subsequent addendum/corrigendum shall be published only at the websites sppp.raj.nic.in & <http://eproc.rajasthan.gov.in>

Mayor/Vice Chairman
KSCL
Kota

CEO
KSCL
Kota

Copy to following for information:

1. Chairman, KSCL
2. Vice Chairman, KSCL
3. Director, KSCL
4. Director, Local Bodies, Jaipur, Rajasthan
5. Divisional CEO, Kota
6. District Collector, Kota
7. Chief Engineer, Local Bodies, Jaipur
8. Superintending Engineer, Kota Smart City Limited, Kota, Kota
9. CAO, Kota Smart City Limited, Kota, Kota
10. Concerning ExEn/AEn/JEn , Kota Smart City Limited, Kota, Kota
11. Library In , Kota Smart City Limited, Kota, Kota for vide publicity in state and National level paper
12. Oswal Data Processor , Kota Smart City Limited, Kota, Kota for Uploading the tender document on official web portal
13. Notice Board Kota

KOTA SMART CITY LIMITED
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Rajeev Gandhi Bhawan,
Dussehra Maidan, Kota, Rajasthan, 324007



CIN: U75232RJ2016SGC056440

Tel: 0744-2502293 | Fax: 0744-2501282

E-mail : ksclkota@gmail.com
nnkota@gmail.com

No :-

Date :

DETAILED NIB

NIB No. 01/2016-17

Notice inviting on line bids for Development of Dussehra Maiden Work under Phase-I (NCB)

KOTA SMART CITY LIMITED Kota invites online unconditional bids on behalf of the Governor of Rajasthan through e-procurement portal <http://eproc.rajasthan.gov.in> from eligible bidders.

Bidding will be conducted through procedures in accordance with the RTPP Act 2012 and RTPP Rules 2013, amended upto date and under national Competitive Bidding with Single Stage -two envelopes bidding procedure with prequalification filter and are open to all national Bidders.

Name & Address of the Procuring Entity	CEO Rajeev Gandhi Bhawan Dushera Ground Kota KOTA SMART CITY LIMITED Kota
Subject Matter of Procurement	Development of Dussehra Maiden(Phase-I) Kota with 1 year defect liability and 03 years O&M
Period of completion of physical works for each package	12 Months
Bid Procedure	Single-stage: Two Part (envelope) open competitive eBid procedure at http://eproc.rajasthan.gov.in
Bid Evaluation Criteria (Selection Method)	Least Cost based selection
Eligibility Criteria	As detailed in bid documents
Websites for downloading Bidding Document	sppp.rajasthan.gov.in eproc.rajasthan.gov.in
Fees	Bidding document fee (Non-Refundable): Rs. 20000/-(Rupees Twenty Thousand only) in Cash/Demand Draft drawn on any Scheduled/ Commercial Bank in favour of "CEO, Municipal Corporation" payable at "Kota". Tender Processing Fee (Non-Refundable): Rs. 1000 (Rupees One Thousand only) in Demand Draft drawn on any Scheduled/Commercial Bank in favour of "Managing Director, RISL" payable at "Jaipur".

Estimated Procurement Cost	Rs. 64,26,70000/- (Sixty four Crore twenty six lac seventy thousand only)
Earnest Money and Mode of Payment	Rs. 1,28,54000/- (One Crore twenty eight lac fifty four thousand only) Mode of Payment: Banker's Cheque/Demand Draft drawn on any Scheduled Commercial Bank or Bank Guarantee as per Bid document.
Period of on-line availability of Bidding Documents (Start / End Date)	Start Date :- From: 28.12.2016, 11:00 AM
	End Date :- Till 06:00 PM of 16.01.2017
Pre-bid Meeting	Date/ Time 03.01.17 at 12:00 Noon Place: Room No.- 202, KOTA SMART CITY LIMITED Kota
Manner, End Date for submission of Bids	Manner: Online at eProc website (http://eproc.rajasthan.gov.in) End Date: 16.01.17 (up to 06:00 P.M.)
Submission of original Banker's Cheque/ Demand Draft for Bid Document cost, Earnest Money, Bid Processing Fee & other documents listed herein after	upto 17.01.2017 till 11:00 AM
Date & Time of Technical Bid Opening	Date: 17.01.2017 Time: 12:00 noon
Date/ Time/ Place of Financial Bid Opening	Will be intimated later to the Technically qualified bidders
Bid Validity	90 days from the bid submission deadline

Note:

- 1) Bidders (authorised signatory) shall submit their offer on-line in Electronic formats both for technical and financial proposal. However, DD / Banker's Cheques / BG (if applicable) for RFP Document Fees, RISL Processing Fees and Earnest Money should be submitted physically in original at the office of KOTA SMART CITY LIMITED Kota by time and date mentioned above as prescribed in bid document and scanned copy of same should also be uploaded along with the technical Bid/ cover.
- 2) In addition to above, the following original documents should also be submitted physically in the KOTA SMART CITY LIMITED Kota office by time and date mentioned above and scanned copies of same should also be uploaded along with the technical Bid/ cover:
 - i. Letter of Technical Bid
 - ii. Power of Attorney for appointing authorized representative
 - iii. Joint Venture Agreement (if applicable)
- 3) Any subsequent addendum/corrigendum shall be published only at the websites sppp.raj.nic.in & <http://eproc.rajasthan.gov.in> and will not be published in newspapers. In case there is a holiday on the day of opening of bids, activities assigned on that date shall be carried out on the next working day.
- 4) Before electronically submitting the bids, it should be ensured that all the bid documents including conditions of contract are digitally signed by the bidder.
- 5) Department will not be responsible for delay in online submission due to any reason. For this, bidders are requested to upload the complete bid well advance in time so as to avoid 11th hour issues like slow speed; choking of web site due to heavy load or any other unforeseen problems
- 6) All the prospective bidders are encouraged to participate in the pre-bid meeting and it is advised that the work sites are visited and bid documents are studied thoroughly.
- 7) The procuring entity reserves the sole right to cancel the bid process and reject any or all of the Bids without assigning any reason
- 8) Procurement entity disclaims any factual/ or other errors in the bidding document (the onus is purely on the individual bidders to verify such information) and the information provided therein are intended only to help the bidders to prepare a logical bid-proposal
- 9) No conditional bids shall be accepted and such bids shall be summarily rejected forthwith.
- 10) The provisions of RTPP Act 2012 and Rules 2013 thereto shall be applicable for this procurement. Furthermore, in case of any inconsistency in any of the provisions of this bidding document with the RTPP Act 2012 and Rules thereto, the latter shall prevail.
- 11) **Nagar Nigam, Kota/Municipal Corporation Kota to be read as Kota Smart City Limited.**

Mayor/Vice Chairman
Kota Smart City Limited, Kota
Kota

CEO
Kota Smart City Limited, Kota
Kota

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SECTION-I: INSTRUCTION TO BIDDERS

SECTION-I: INSTRUCTION TO BIDDERS

Important Instruction:- The Law relating to procurement “The Rajasthan Transparency in Public Procurement Act, 2012” [hereinafter called the Act] and the “Rajasthan Public Procurement Rules, 2012” [hereinafter called the Rules] under the said Act have come into force which are available on the website of State Public Procurement Portal <http://sppp.raj.nic.in>. Therefore, the Bidders are advised to acquaint themselves with the provisions of the Act and the Rules before participating in the Bidding process. If there is any discrepancy between the provisions of the Act and the Rules and this Bidding Document, the provisions of the Law shall prevail.

1. General			
1.1	Scope of Bid	1.1.1	In support of the Invitation to Bid indicated in the Bid Data Sheet (BDS), the Procuring Entity as indicated in the BDS, issues this Bidding Document for the procurement of works as named in the BDS and as specified in Section V, Procuring Entity's Requirements.
1.2	Interpretation	1.2.1	Throughout this Bidding Document: the term “in writing” means communicated in written form through letter, fax, e-mail etc. with proof of receipt. if the context so requires, singular means plural and vice versa; and “Day” means calendar day
1.3	Code of Integrity	1.3.1	Any person participating in the procurement process shall,- i. not offer any bribe, reward or gift or any material benefit either directly or indirectly in exchange for an unfair advantage in procurement process or to otherwise influence the procurement process; ii. not misrepresent or omit that misleads or attempts to mislead so as to obtain a financial or other benefit or avoid an obligation; iii. not indulge in any collusion, bid rigging or anti-competitive behavior to impair the transparency, fairness and progress of the procurement process; iv. not misuse any information shared between the Procuring Entity and the Bidders with an intent to gain unfair advantage in the procurement process; v. not indulge in any coercion including impairing or harming or threatening to do the same, directly or indirectly, to any party or to its property to influence the procurement process; vi. not obstruct any investigation or audit of a procurement

			<p>process;</p> <p>vii. disclose conflict of interest, if any; and</p> <p>viii. disclose any previous transgressions with any Entity in India or any other country during the last three years or any debarment by any other Procuring Entity.</p>
		1.3.2	<p>Conflict of Interest: A conflict of interest is considered to be a situation in which a party has interests that could improperly influence that party's performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations.</p> <p>A Bidder may be considered to be in conflict of interest with one or more parties in this bidding process if, including but not limited to:</p> <ul style="list-style-type: none"> i. have controlling partners/ share holders in common; or ii. receive or have received any direct or in direct subsidy from any of them ;or iii. have the same legal representative for purposes of this Bid; or iv. have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the Bid of another Bidder, or influence the decisions of the Procuring Entity regarding this bidding process; or v. the Bidder participates in more than one Bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all Bids in which the Bidder is involved. However, this does not limit the inclusion of the same subcontractor, not otherwise participating as a Bidder, in more than one Bid; or vi. the Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the Works that are the subject of the Bid; or vii. the Bidder or any of its affiliates has been hired (or is proposed to be hired) by the Procuring Entity as Engineer-in-charge/ consultant for the Contract.
		1.3.3	<p>The Bidder shall have to give a declaration regarding compliance of the Code of Integrity prescribed in the Act, the Rules and stated above in this Clause along with its Bid, in the format specified in Section IV, Bidding Forms.</p>

		1.3.4	Breach of Code of Integrity by the Bidder: - Without prejudice to the provisions of Chapter IV of the Rajasthan Transparency in Public Procurement Act, in case of any breach of the Code of Integrity by a Bidder or prospective Bidder, as the case may be, the Procuring Entity may take appropriate action in accordance with the provisions of sub-section (3) of section 11 and section 46 of the Act.
1.4	Eligible Bidders	1.4.1	<p>A Bidder may be a natural person, private Entity, government-owned Entity or, where permitted in the Bidding documents, any combination of them with a formal intent to enter into an agreement or under an existing agreement in the form of a Joint Venture [JV], Consortium or Association. In the case of a Joint Venture, Consortium or Association:-</p> <p>all parties to the Joint Venture, Consortium or Association shall sign the Bid and they shall be jointly and severally liable; and a Joint Venture, Consortium or Association shall nominate a representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the Joint Venture, Consortium or Association during the Bidding process. In the event the Bid of Joint Venture, Consortium or Association is accepted, either they shall form a registered Joint Venture, Consortium or Association as company/firm or otherwise all the parties to Joint Venture, Consortium or Association shall sign the Agreement.</p>
		1.4.2	A Bidder, and all parties constituting the Bidder, shall have the nationality of India. In case of International Competitive Bidding or Joint Venture, Consortium or Association [where permitted], the nationality of the Bidder and all parties constituting the Bidder shall be of India or an eligible country declared as such by Government of India. A Bidder shall be deemed to have nationality of a country if the Bidder is a citizen or constituted or incorporated, and operates in conformity with the provisions of the Laws of that country. This criterion shall also apply to the determination of the nationality of proposed Sub-Contractors or suppliers for any part of the Contract including related services.
		1.4.3	A Bidder should not have a conflict of interest in the procurement in question as stated in the Rule 81 and this Bidding document.
		1.4.4	A Bidder debarred under section 46 of the Act shall not be eligible to participate in any procurement process undertaken by any Procuring Entity, if debarred by the State Government; and a Procuring Entity, if debarred by such Procuring Entity.

		1.4.5	The Bidder must be a registered Contractor in appropriate class with the Department/ Organization. He shall furnish necessary proof for the same.PSU can be participate in tender without registration.
		1.4.6	<p>i Any change in the constitution of the firm, etc., shall be notified forth with by the Bidder in writing to the Procuring Entity and such change shall not relieve any former partner/ member of the firm, etc from any liability under the Contract.</p> <p>ii No new partner/partners shall be accepted in the firm by the Bidder in respect of the contract unless he/they agree to abide by all its terms, conditions and deposit with the Procuring Entity a written agreement to this effect. The Bidder's receipt for acknowledgement or that of any partners subsequently accepted as above shall bind all of them and will be sufficient discharge for any of the purpose of the Contract.</p> <p>iii The status of the lead partner/ representative of the Joint Venture, Consortium or Association as a major stake holder shall not change without the consent of the Procuring Entity. New major stake holder must agree to abide by all terms and conditions of the Contract.</p>
		1.4.7	Bidders shall provide such evidence of their continued eligibility satisfactory to the Procuring Entity, should the Procuring Entity request.
		1.4.8	In case a prequalification or empanelment or registration process has been conducted prior to the bidding process, this bidding shall be open only to the pre-qualified, empanelled or registered Bidders.
		1.4.9	Each Bidder shall submit only one Bid except in case of alternative bids, if permitted.
		1.4.10	<p>Bidder who is not registered under the Sales Tax Act prevalent in the State of Rajasthan can bid, however selected bidder shall have to be got registered with the Sales Tax department of the state government and submit the proof of registration before signing the Contract agreement.</p> <p>He is also required to provide proof of Permanent Account Number (PAN) given by Income Tax Department.</p>
2. Contents of Bidding Document			

2.1	Sections of the Bidding Document	2.1.1	<p>The Bidding Document consists of Parts I, II, and III, which include all the Sections indicated below, and should be read in conjunction with any Addenda issued in accordance with ITB Clause 2.3 [Amendment of Bidding Document].</p> <p>Part I: Bidding Procedures</p> <p>Section I. Instructions to Bidders (ITB)</p> <p>Section II. Bid Data Sheet (BDS)</p> <p>Section III. Evaluation and Qualification Criteria</p> <p>Section IV. Bidding Forms</p> <p>Part II: Requirements</p> <p>Section V. Procuring Entity's Requirements.</p> <p>Part III: Contract</p> <p>Section VI A. General Conditions of Contract [GCC]</p> <p>Section VI B. Special Conditions of Contract [SCC]</p> <p>Section VI C. Contract Forms</p>
		2.1.2	<p>The Invitation for Bids (NIB) issued by the Procuring Entity is also part of the Bidding Document.</p>
		2.1.3	<p>i. The Bidding Document shall be uploaded on the e-procurement portal, eproc.raj.nic.in along with the Notice Inviting Bids. The complete Bidding Document shall also be placed on the State Public Procurement Portal, sPPP.raj.nic.in. The prospective Bidders may download the bidding document from these portals. The price of the Bidding Document and processing fee of e-bid shall have to be paid to the Procuring Entity in the amount and manner as specified in Bid Data Sheet and e-procurement portal.</p>
		2.1.4	<p>The Procuring Entity is not responsible for the completeness of the Bidding Document and its addenda, if they were not downloaded correctly from the e-procurement portal or the State Public Procurement Portal.</p>
		2.1.5	<p>The Bidder is expected to examine all instructions, forms, terms and specifications in the Bidding Document. Failure to furnish all information or authentic documentation required by the Bidding Document may result in the rejection of the Bid.</p>

2.2	Clarification of Bidding Document and Pre-Bid Conference	2.2.1	The Bidder shall be deemed to have carefully examined the conditions, specifications, size, make and drawings, etc. of the Works and Related Services to be provided. If any Bidder has any doubts as to the meaning of any portion of the conditions or of the specifications, drawings etc., it shall, before submitting the Bid, refer the same to the Procuring Entity and get clarifications. A Bidder requiring any clarification of the Bidding Document shall contact the Procuring Entity in writing or e-mail at the Procuring Entity's address indicated in the BDS. The Procuring Entity will respond in writing or e-mail to any request for clarification, within seven days provided that such request is received no later than twenty-one (21) days prior to the deadline for submission of Bids as specified in ITB Sub-Clause 4.2.1[Deadline for Submission of Bids]. The clarification issued, including a description of the inquiry but without identifying its source shall also be placed on the State Public Procurement Portal and should the Procuring Entity deem it necessary to amend the Bidding Document as a result of a clarification, it shall do so following the procedure under ITB Clause 2.3 [Amendment of Bidding Document] through an addendum which shall form part of the Bidding Document..
		2.2.2	The Bidder or his authorized representative is invited to attend the Pre- Bid Conference, if provided for in the BDS. The purpose of the Pre- Bid Conference will be to clarify issues and to answer questions on any matter related to this procurement that may be raised at that stage. If required, a conducted site visit may be arranged by the Procuring Entity.
		2.2.3	The Bidder is requested, to submit questions in writing, to reach the Procuring Entity not later than one week before the date of Pre-Bid Conference.
		2.2.4	Minutes of the Pre-Bid Conference, including the text of the questions raised, and the responses given, without identifying the source, will be transmitted promptly to all Bidders who attended the Pre-Bid Conference and shall also be placed on the State Public Procurement Portal and the e-procurement portal. Any modification to the Bidding Document that may become necessary as a result of the Pre-Bid Conference shall be made by the Procuring Entity exclusively through the issue of an addendum (part of Bid document) and not through the minutes of the Pre-Bid Conference.
		2.2.5	At any time prior to the deadline for submission of the Bids, the Procuring Entity, suomotto, may also amend the Bidding Document, if required, by issuing an addenda which will form part of the Bidding Document.

		2.2.6	Non-attendance at the Pre-Bid Conference will not be a cause for disqualification of a Bidder.
2.3	Amendment of Bidding Document	2.3.1	Any addendum issued shall be part of the Bidding Document and shall be uploaded on the State Public Procurement Portal and the e-procurement portal.
		2.3.2	To give prospective Bidders reasonable time in which to take an addendum into account in preparing their Bids, the Procuring Entity may, at its discretion, extend the deadline for the submission of the Bids, pursuant to ITB Sub-Clause 4.2 [Deadline for Submission of Bids], under due publication on the State Public Procurement Portal and the e-procurement portal and newspapers.
3. Preparation of Bids			
3.1	Cost of Bidding	3.1.1	The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Procuring Entity shall not be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.
		3.1.2	The Bidder shall furnish the scanned attested copies of following documents with its Bid:- i. Partnership Deed and valid registration certificate with the Registrar of Firms in case of Partnership Firms. Power of Attorney in favour of the partner signing/submitting the Bid, authorizing him to represent all partners of the firm. ii. VAT/ Sales Tax registration certificate and VAT/Sales Tax clearance certificate from the concerned Commercial Taxes Officer and Permanent Account Number (PAN) given by the Income Tax Department. iii. Address of residence and office, telephone numbers e-mail address in case of sole Proprietorship. iv. Certificate of Registration and Memorandum of Association issued by Registrar of Companies in case of a registered company and in case of any other statutory or registered body, certificate of incorporation or registration issued by concerned authorities. Power of attorney in favour of the person signing the Bid. v. Where permitted to bid as Joint Venture, Consortium or Association, letter of formal intent to enter in to an agreement or an existing agreement in the form of a Joint Venture, Consortium or Association.
3.2	Language of Bid	3.2.1	The Bid, as well as all correspondence and documents relating to the Bid exchanged by the Bidder and the Procuring Entity, shall be written in English/ Hindi or a

			language specified in the BDS. Supporting documents and printed literature that are part of the Bid may be in another language provided they are accompanied by an accurate translation of the relevant passages duly accepted by the Bidder in English/ Hindi or the language specified in the BDS, in which case, for purposes of interpretation of the Bid, such translation shall govern.
3.3	Documents Comprising the Bid	3.3.1	<p>The Bid shall comprise of two covers, one containing the Technical Bid/ Proposal and the other the Financial or Price Bid/ Proposal.</p> <p>One more cover containing scanned copies of proof of payment in form specified in Bid Data Sheet, of the price of Bidding Document, processing fee and Bid Security/ Bid Securing Declaration shall be enclosed separately.</p>
		3.3.2	<p>The Technical Bid/ Proposal shall contain the following :</p> <ul style="list-style-type: none"> i. Technical Bid/ Proposal Submission Sheet and Technical Bid containing the filled up Bidding Forms and Declarations related to Technical Bid and Code of Integrity given in Section IV [Bidding Forms]; ii. proof of payment of price of Bidding Document, processing fee, Bid Security, in accordance with ITB Clause 3.10; iii. written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB Clause 3.11; iv. documentary evidence in accordance with ITB Clause 3.7 establishing the Bidder's eligibility to bid; v. documentary evidence in accordance with ITB Clause 3.8 establishing the Bidder's qualifications to perform the contract if its Bid is accepted; vi. Drawings/ designs in support of the Works to be executed; vii. the Notice Inviting Bids; viii. any other document required in the BDS; and ix. others considered necessary to strengthen the Bid submitted.
		3.3.3	<p>The Financial Bid/ Price Proposal shall contain the following :</p> <p>Financial Bid/ Price Proposal Submission Sheet and the applicable Price Schedules, in accordance with ITB Clauses 3.4, 3.5;</p>

			Any other document required in the BDS.
3.4	Bid Submission Sheets and Price Schedules	3.4.1	The Bidder shall submit the Technical Bid and Financial Bid using the Bid Submission Sheets provided in Section IV [Bidding Forms]. These forms must be completed without any alterations to their format, and no substitutes shall be accepted. All blank spaces shall be filled in with the information requested.
		3.4.2	The Bidder shall submit as part of the Financial Bid, the Price Schedules for Works, using the forms provided in Section IV [Bidding Forms].
3.5	Bid Prices	3.5.1	<p>i. In case of Item Rate Contracts, the Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by the Bidder will not be paid for by the Procuring Entity but will have to be executed and shall be deemed covered by the rates for other items and prices in the Bill of Quantities.</p> <p>ii. In case of Percentage Rate Contracts, combined single percentage above or below must be quoted by the Bidder for all items of the Bill of Quantities.</p> <p>iii. In case of Lump Sum Contracts, only Total Price which the Bidder wants to charge for the entire Works with all its contingencies in accordance with drawings and specifications shall be quoted by the Bidder. A Schedule of Rates shall be specified in the Bid Data Sheet in order to regulate the amount to be added to or deducted from the fixed sum on account of additions and alterations not covered by the Contract. Payments shall be linked to various stages of completion of the Works specified in Activity Schedule given in Bid Data Sheet.</p>
		3.5.2	Prices quoted by the Bidder shall be fixed during the Bidder's Performance of the Contract and not subject to variation on any account, unless otherwise specified in the BDS. A Bid submitted with an adjustable price quotation shall be treated as non-responsive and shall be rejected, pursuant to ITB Clause 5.7 [Responsiveness of Bids]. However, if in accordance with the BDS, prices quoted by the Bidder shall be subject to adjustment during the performance of the Contract, a Bid submitted with a fixed price quotation shall not be rejected, but the price adjustment shall be treated as zero.

		3.5.3	All duties, taxes and other levies payable by the Bidder under the contract, or for any other cause, shall be included in the rates and prices, and the total Bid Price submitted by the Bidder.
3.6	Currencies of Bid.	3.6.1	The unit rates and the prices shall be quoted by the Bidder entirely in Indian Rupees unless otherwise specified in BDS. All payments shall be made in Indian Rupees only, unless otherwise specified in the BDS.
3.7	Documents Establishing the Eligibility of the Bidder	3.7.1	To establish their eligibility in accordance with ITB Clause 1.4 [Eligible Bidders], Bidders shall: complete the eligibility declarations in the Bid Submission Sheet and Declaration Form included in Section IV [Bidding Forms]; if the Bidder is an existing or intended Joint Venture [JV], Consortium or Association in accordance with ITB Sub-Clause 1.4.1, shall submit a copy of the Agreement, or a letter of intent to enter into such Agreement. The respective document shall be signed by all legally authorized signatories of all the parties to the existing or intended JV, Consortium or Association as appropriate; and the existing or intended JV shall authorize an individual/partner in one of the firms as lead partner of the JV to act and commit all the partners of JV for the Bid.
3.8	Documents Establishing the Qualifications of the Bidder	3.8.1	To establish its qualifications to perform the Contract, the Bidder shall submit as part of its Technical Proposal the documentary evidence indicated for each qualification criteria specified in Section III, [Evaluation and Qualification Criteria].
3.9	Period of Validity of Bids	3.9.1	Bids shall remain valid for 90 days or the period specified in the BDS after the Bid submission deadline date as specified by the Procuring Entity. A Bid valid for a shorter period shall be rejected by the Procuring Entity as non-responsive.
		3.9.2	In exceptional circumstances, prior to the expiration of the Bid validity period, the Procuring Entity may request Bidders to extend the period of validity of their Bids. The request and the responses shall be made in writing. The Bid Security or a Bid Securing Declaration in accordance with ITB Clause 3.10 [Bid Security] shall also be got extended for thirty days beyond the dead line of the extended validity period. A Bidder may refuse the request without forfeiting its Bid Security or a Bid Securing Declaration. A Bidder granting the request shall not be permitted to modify its Bid.
3.10	Bid Security	3.10.1	Unless otherwise specified in the BDS, the Bidder shall furnish as part of its Bid, a Bid Security for the amount specified in the BDS.

		3.10.2	Bid Security shall be 2% of the value of the Works indicated in the NIB. For bidders registered with the Procuring Entity, the bid security shall be 0.5% of the value of works indicated in the NIB. The bid security shall be in Indian Rupees, if not otherwise specified in the BDS.
		3.10.3	The Bid Security may be given in the form of a banker's Cheque or demand draft or bank guarantee of a Scheduled Bank in India, in specified format, or deposited through eGRAS/ net banking, if permitted.
		3.10.4	In lieu of Bid Security, a Bid Securing Declaration shall be taken from Government Departments and State Government Public Sector Enterprises, Autonomous bodies, Registered Societies, Cooperative Societies which are owned or controlled or managed by the State Government, Public Sector Enterprises of Central Government. For the Bid Securing Declaration the Bidder shall use the form included in Section IV [Bidding Forms].
		3.10.5	Scanned copy of Bid Security instrument or a Bid Securing Declaration shall necessarily accompany the sealed Bid. Any Bid not accompanied by Bid Security or Bid Securing Declaration, if not exempted, shall be liable to be rejected.
		3.10.6	Bid Security of a Bidder lying with the Procuring Entity in respect of other Bids awaiting decision shall not be adjusted towards Bid Security for the this Bid. The Bid Security originally deposited may, however be taken into consideration in case Bids are re-invited.
		3.10.7	The issuer of the Bid Security and the confirmer, if any, of the Bid Security, as well as the form and terms of the Bid Security, must be acceptable to the Procuring Entity.
		3.10.8	Prior to submitting its Bid, a Bidder may request the Procuring Entity to confirm the acceptability of a proposed issuer of a Bid Security or of a proposed confirmer, if different than as specified in ITB Clause 3.10.3. The Procuring Entity shall respond promptly to such a request.
		3.10.9	The bank guarantee presented as Bid Security shall be got confirmed from the concerned issuing bank. However, the confirmation of the acceptability of a proposed issuer or of any proposed confirmer does not preclude the Procuring Entity from rejecting the Bid Security on the ground that the issuer or the confirmer, as the case may be, has become insolvent or is under liquidation or has otherwise ceased to be creditworthy.

		3.10.10	The Bid Security of unsuccessful Bidders shall be refunded soon after final acceptance of successful Bid and signing of Contract Agreement and submitting Performance Security by successful Bidder pursuant to ITB Clause 6.4 [Performance Security].
		3.10.11	<p>The Bid Security taken from a Bidder shall be forfeited in the following cases, namely:-</p> <ul style="list-style-type: none"> i. when the Bidder withdraws or modifies his Bid after opening of Bids; or ii. when the Bidder does not execute the agreement in accordance with ITB Clause 6.3 [Signing of Contract] after issue of letter of acceptance/ placement of Work order within the specified time period; or iii. when the Bidder fails to commence the Works as per Work Order within the time specified; or iv. when the Bidder does not deposit the Performance Security in accordance with ITB Clause 6.4 [Performance Security]; in the prescribed time limit after the work order is placed; v. if the Bidder breaches any provision of the Code of Integrity prescribed for Bidders in the Act and Chapter VI of the Rules or as specified in ITB Clause 1.3 [Code of Integrity]; or vi. if the Bidder does not accept the correction of its Bid Price pursuant to ITB Sub-Clause 5.5 [Correction of Arithmetical Errors].
		3.10.12	In case of the successful bidder, the amount of Bid Security may be adjusted in arriving at the amount of the Performance Security, or refunded if the successful bidder furnishes the full amount of Performance Security. No interest will be paid by the Procuring Entity on the amount of Bid Security.
		3.10.13	<p>The Procuring Entity shall promptly refund the Bid Security of the Bidders at the earliest of any of the following events, namely:-</p> <ul style="list-style-type: none"> i. the expiry of validity of Bid Security; ii. the execution of agreement for procurement and Performance Security is furnished by the successful bidder; iii. the cancellation of the procurement process; or iv. the withdrawal of Bid prior to the deadline for presenting Bids, unless the Bidding Document stipulates that no

			such withdrawal is permitted.
		3.10.14	The Bid Security of a Joint Venture, Consortium or Association must be in the name of the Joint Venture, Consortium or Association that submits the Bid. If the Joint Venture, Consortium or Association has not been legally constituted at the time of Bidding, the members of the proposed consortium or JV shall enter in to an Agreement to form a legally constituted JV after the issue of Letter of Acceptance / Letter of Intent to them and also declare a partner as the lead partner in whose name the Bid Security may be submitted.
3.11	Format and Signing of Bid	3.11.1	All pages of the Technical and Financial Bid shall be digitally signed by the Bidder or authorised signatory on behalf of the Bidder. This authorisation shall consist of a written confirmation as specified in the BDS and shall be attached to the Bid. In case of a Joint Venture, Consortium or Association, if the Joint Venture, Consortium or Association has not been legally constituted at the time of Bidding, all the members of the proposed Joint Venture, Consortium or Association shall digitally sign the Bid.
4. Submission and Opening of Bids			
4.1	Sealing and Marking of Bids	4.1.1	Bidders shall submit their Bids to the Procuring Entity electronically only on the e-procurement portal, eproc.raj.nic.in. In submission of their Bids, the Bidders should follow the step by step instructions given on the e-procurement portal.
		4.1.2	The Bidder shall enclose the Technical Bid and the Financial Bid in separate covers. The proof of payment of price of Bidding Document, processing fee and Bid Security shall be enclosed in third cover. The price of Bidding Document and Bid Security shall be paid in the name of the Procuring Entity and the processing fee shall be paid in the name of RISL.
4.2	Deadline for Submission of Bids	4.2.1	Bids shall be submitted electronically only upto the time and date specified in the Notice Inviting Bids and BDS or an extension issued thereof.
4.3	Withdrawal, Substitution and Modification of Bids	4.3.1	A Bidder may withdraw, substitute or modify its Bid after it has been submitted by submitting electronically on the e-procurement portal a written Withdrawal/ Substitutions/ Modifications etc. Notice on the e-procurement portal, duly digitally signed by the Bidder or his authorised representative, and shall include a copy of the authorisation in accordance with ITB Sub-Clause 3.11.1 [Format and Signing of Bid]. The corresponding Withdrawal, Substitution or Modification of the Bid must accompany the respective written Notice. All Notices must be received by the Procuring Entity on the e-procurement portal prior to the deadline

			specified for submission of Bids in accordance with ITB Sub-Clause 4.2. [Deadline for Submission of Bids].
		4.3.2	No Bid shall be withdrawn, substituted or modified in the interval between the deadline for submission of the Bid and the expiration of the period of Bid validity specified in ITB Clause 3.9.[Period of Validity of Bids] or any extension thereof.
4.4	Bid Opening	4.4.1	The electronic Technical Bids shall be opened by the Bids opening committee constituted by the Procuring Entity at the time, date and place specified in the Bid Data Sheet in the presence of the Bidders or their authorised representatives, who choose to be present.
		4.4.2	The Bids opening committee may co-opt experienced persons in the committee to conduct the process of Bid opening.
		4.4.3	The Bidders may choose to witness the electronic Bid opening procedure online.
		4.4.4	The Financial Bids shall be kept unopened until the time of opening of the Financial Bids. The date, time, and location of electronic opening of the Financial Bids shall be intimated to the bidders who are found qualified by the Procuring Entity in evaluation of their Technical Bids.
		4.4.5	The Bids opening committee shall prepare a list of the Bidders or their representatives attending the opening of Bids and obtain their signatures on the same. The list shall also contain the representative's name and telephone number and corresponding Bidders' names and addresses. The authority letters brought by the representatives shall be attached to the list. The list shall be signed by all the members of Bids opening committee with date and time of opening of the Bids.
		4.4.6	First, covers marked as "WITHDRAWAL" shall be opened, read out, and recorded and the covers containing the corresponding Technical Bids and Financial Bids shall not be opened. No Bid shall be permitted to be withdrawn unless the corresponding withdrawal notice contains a valid authorisation to request the withdrawal and is readout and recorded at Bid opening. If the withdrawal notice is not accompanied by the valid authorisation, the withdrawal shall not be permitted and the corresponding Technical Bid shall be opened. Next, covers marked as "SUBSTITUTION Technical Bid" shall be opened, read out, recorded. The covers containing the Substitution Technical Bids and/ or Substitution Financial Bids shall be exchanged for the corresponding covers being substituted. Only the Substitution Technical Bids shall be

			<p>opened, read out, and recorded. Substitution Financial Bids will remain unopened in accordance with ITB Sub-Clause 4.4.4. No Bid shall be substituted unless the corresponding substitution notice contains a valid authorisation to request the substitution and is read out and recorded at Bid opening.</p> <p>Covers marked as "MODIFICATION Technical Bid" shall be opened thereafter, read out and recorded with the corresponding Technical Bids. No Technical Bid and/ or Financial Bid shall be modified unless the corresponding modification notice contains a valid authorisation to request the modification and is read out and recorded at opening of Technical Bids. Only the Technical Bids, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Financial Bids, both Original as well as Modification, will remain unopened in accordance with ITB Sub-Clause 4.4.4.</p>
		4.4.7	<p>All other covers containing the Technical Bids shall be opened one at a time and the following read out and recorded-</p> <ul style="list-style-type: none"> i. the name of the Bidder; ii. whether there is a modification or substitution; iii. whether proof of payment of Bid Security or Bid Securing Declaration, if required, payment of price of the Bidding Document and processing fee have been enclosed; iv. any other details as the Bids opening committee may consider appropriate. <p>After all the Bids have been opened, their hard copies shall be printed and shall be initialed and dated on the first page and other important papers of each Bid by the members of the Bids opening committee.</p>
		4.4.8	<p>Only Technical Bids shall be read out and recorded at the bid opening and shall be considered for evaluation. No Bid shall be rejected at the time of opening of Technical Bids except Alternative Bids (if not permitted) and Bids not accompanied with the proof of payment of the required price of Bidding Document, processing fee and Bid Security.</p>
		4.4.9	<p>The Bids opening committee shall prepare a record of opening of Technical Bids that shall include, as a minimum: the name of the Bidder and whether there is a withdrawal, substitution, modification, or alternative offer (if they were permitted), any conditions put by Bidder and the presence or absence of the price of Bidding Document, processing fee and Bid Security. The Bidders or their representatives, who are present, shall sign the record. The members of the Bids</p>

			opening committee shall also sign the record with date.
		4.4.10	After completion of the evaluation of the Technical Bids, the Procuring Entity shall invite Bidders who have submitted substantially responsive Technical Bids and who have been determined as being qualified to attend the electronic opening of the Financial Bids. The date, time, and location of the opening of Financial Bids will be intimated in writing by the Procuring Entity. Bidders shall be given reasonable notice of the opening of Financial Bids.
		4.4.11	The Procuring Entity shall notify Bidders in writing whose Technical Bids have been rejected on the grounds of being substantially non-responsive and not qualified in accordance with the requirements of the Bidding Document.
		4.4.12	The Bids opening committee shall conduct the electronic opening of Financial Bids of all Bidders who submitted substantially responsive Technical Bids and have qualified in evaluation of Technical Bids, in the presence of Bidders or their representatives who choose to be present at the address, date and time specified by the Procuring Entity.
		4.4.13	<p>All covers containing the Financial Bids shall be opened one at a time and the following read out and recorded-</p> <ul style="list-style-type: none"> i. the name of the Bidder; ii. whether there is a modification or substitution; iii. the Bid Prices; iv. any other details as the Bids opening committee may consider appropriate. <p>After all the Bids have been opened, their hard copies shall be printed and shall be initialed and dated on the first page of the each Bid by the members of the Bids opening committee. All the pages of the Price Schedule and letters, Bill of Quantities attached shall be initialed and dated by the members of the committee. Key information such as prices, completion period, etc. shall be encircled and unfilled spaces in the Bids shall be marked and signed with date by the members of the Bids opening committee.</p>
		4.4.14	The Bids opening committee shall prepare a record of opening of Financial Bids that shall include as a minimum: the name of the Bidder and whether there is a withdrawal, substitution, or modification, the Bid Price, any conditions, any discounts and alternative offers (if they were permitted). The Bidders or their representatives, who are present, shall sign the record. The members of the Bids opening

			committee shall also sign the record with date.
5. Evaluation and Comparison of Bids			
5.1	Confidentiality	5.1.1	Information relating to the examination, evaluation, comparison, and post-qualification of Bids, and recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with such process until information on Contract award is communicated to all Bidders.
		5.1.2	Any attempt by a Bidder to influence the Procuring Entity in its examination of qualification, evaluation, comparison of the Bids or Contract award decisions may resulting in the rejection of its Bid, in addition to the legal action which may be taken by the Procuring Entity under the Act and the Rules.
		5.1.3	Notwithstanding ITB Sub-Clause 5.1.2 [Confidentiality], from the time of opening the Bid to the time of Contract award, if any Bidder wishes to contact the Procuring Entity on any matter related to the Bidding process, it shall do so in writing.
		5.1.4	In addition to the restrictions specified in section 49 of the Act, the Procuring Entity, while procuring a subject matter of such nature which requires the procuring Entity to maintain confidentiality, may impose condition for protecting confidentiality of such information.
5.2	Clarification of Technical or Financial Bids	5.2.1	To assist in the examination, evaluation, comparison and qualification of the Technical or Financial Bids, the Bid evaluation committee may, at its discretion, ask any Bidder for a clarification regarding his Bid. The committee's request for clarification and the response of the Bidder shall be in writing.
		5.2.2	Any clarification submitted by a Bidder with regard to his Bid that is not in response to a request by the Bid evaluation committee shall not be considered.
		5.2.3	No change in the prices or substance of the Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetical errors discovered by the Bid evaluation committee in the evaluation of the financial Bids.
		5.2.4	No substantive change to qualification information or to a submission, including changes aimed at making an unqualified Bidder, qualified or an unresponsive submission, responsive shall be sought, offered or permitted.

5.3	Deviations, Reservations and Omissions in Technical or Financial Bids	5.3.1	<p>During the evaluation of Technical or Financial Bids, the following definitions apply:</p> <p>i. "Deviation" is a departure from the requirements specified in the Bidding Document;</p> <p>ii. "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and</p> <p>iii. "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.</p>
5.4	Nonmaterial Non conformities in Technical or Financial Bids	5.4.1	<p>Provided that a Technical or Financial Bid is substantially responsive, the Procuring Entity may waive any nonconformities (with recorded reasons) in the Bid that do not constitute a material deviation, reservation or omission.</p>
		5.4.2	<p>Provided that a Technical or Financial Bid is substantially responsive, the Procuring Entity may request the Bidder to submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities or omissions in the Bid related to documentation requirements. Request for information or documentation on such nonconformities shall not be related to any aspect of the Financial Proposal of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.</p>
		5.4.3	<p>* Provided that a Technical or Financial Bid is substantially responsive, the Procuring Entity will rectify nonmaterial nonconformities or omissions (with recorded reasons). To this effect, the Bid Price shall be adjusted during evaluation of Financial Proposals for comparison purposes only, to reflect the price of the missing or non- conforming item or component. The adjustment shall be made using the method indicated in Section III, Evaluation and Qualification Criteria.</p> <p>* [This ITB Sub-Clause should be kept only when considered necessary]</p>
5.5	Correction of Arithmetical Errors in Financial Bid	5.5.1	<p>Provided that a Financial Bid is substantially responsive, the Bid evaluation committee shall correct arithmetical errors during evaluation of Financial Bid on the following basis:</p> <p>i. if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Procuring Entity there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected;</p>

			<p>ii. if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and</p> <p>iii. if there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (i) and (ii) above.</p>
		5.5.2	If the Bidder that submitted the lowest evaluated Bid does not accept the correction of errors, its Bid shall be disqualified and its Bid Security shall be forfeited or its Bid Securing Declaration shall be executed.
5.6	Preliminary Examination of Technical or Financial Bids	5.6.1	The Procuring Entity shall examine the Technical or Financial Bids to confirm that all documents and technical documentation requested in ITB Sub-Clause 3.3 [Documents Comprising the Bid] have been provided, and to determine the completeness of each document submitted.
		5.6.2	<p>The Procuring Entity shall confirm, following the opening of the Technical or Financial Bids, that the following documents and information have been provided :</p> <ul style="list-style-type: none"> i. Bid is signed, as per the requirements listed in the Bidding documents; ii. Bid has been sealed as per instructions provided in the Bidding documents; iii. Bid is valid for the period, specified in the Bidding documents; iv. Bid is accompanied by Bid Security or Bid securing declaration; v. Bid is unconditional and the Bidder has agreed to give the required performance Security; vi. Price Schedules in the Financial Bids are in accordance with ITB Clause 3.4 [Bid Submission Sheets and Price Schedules]; vii. written confirmation of authorization to commit the Bidder; viii. Declaration by the Bidder in compliance of Section 7 and 11 of the Act; and ix. other conditions, as specified in the Bidding Document are fulfilled.

5.7	Responsiveness of Technical or Financial Bids	5.7.1	The Procuring Entity's determination of the responsiveness of a Technical or Financial Bid is to be based on the contents of the Bid itself, as defined in ITB Sub-Clause 3.3 [Documents Comprising the Bid].
		5.7.2	<p>A substantially responsive Technical or Financial Bid is one that meets without material deviation, reservation, or omission to all the terms, conditions, and specifications of the Bidding Document. A material deviation, reservation, or omission is one that:</p> <p>(a) if accepted, would-</p> <ul style="list-style-type: none"> i. affect in any substantial way the scope, quality, or performance of the Goods and Related Services specified in Section V, Schedule of Supply; or ii. limits in any substantial way, inconsistent with the Bidding Document, the Procuring Entity's rights or the Bidder's obligations under the proposed Contract; or <p>(b) if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive Bids.</p>
		5.7.3	The Procuring Entity shall examine the technical aspects of the Bid in particular, to confirm that requirements of Section V, Procuring Entity's Requirements have been met without any material deviation, reservation, or omission.
		5.7.4	If a Technical or Financial Bid is not substantially responsive to the Bidding Document, it shall be rejected by the Procuring Entity and may not subsequently be made responsive by the Bidder by correction of the material deviation, reservation, or omission.
5.8	Examination of Terms and Conditions of the Technical or Financial Bids	5.8.1	The Procuring Entity shall examine the Bids to confirm that all terms and conditions specified in the GCC and the SCC have been accepted by the Bidder without any material deviation or reservation.
		5.8.2	The Procuring Entity shall evaluate the technical aspects of the Bid submitted in accordance with ITB Clauses 3.3 [Documents Comprising the Bid] and to confirm that all requirements specified in Section V [Procuring Entity's Requirements] of the Bidding Document and all amendments or changes requested by the Procuring Entity in accordance with ITB Clause 2.3 [Amendment of Bidding Document] have been met without any material deviation or reservation.

5.9	Evaluation of Qualification of Bidders in Technical Bids	5.9.1	The determination of qualification of a Bidder in evaluation of Technical Bids shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB Clause 3.8 [Documents Establishing the Qualifications of the Bidder] and in accordance with the qualification criteria indicated in Section III [Evaluation and Qualification Criteria]. Factors not included in Section III, shall not be used in the evaluation of the Bidder's qualification.
5.10	Evaluation of Financial Bids	5.10.1	The Procuring Entity shall evaluate each Financial Bid, the corresponding Technical Bid of which has been determined to be substantially responsive
		5.10.2	To evaluate a Financial Bid, the Procuring Entity shall only use all the criteria and methodologies defined in this Clause and in Section III, Evaluation and Qualification Criteria. No other criteria or methodology shall be permitted.
		5.10.3	To evaluate a Financial Bid, the Procuring Entity shall consider the following: <ul style="list-style-type: none"> i. the Bid Price quoted in the Financial Bid; ii. price adjustment for correction of arithmetical errors in accordance with ITB Clause 5.5 [Correction of Arithmetical Errors]; iii. adjustment of bid prices due to rectification of nonmaterial nonconformities or omissions in accordance with ITB Sub Clause 5.4.3 [Nonmaterial Nonconformities in Bids], if applicable.
		5.10.4	If the Bid, which results in the lowest evaluated Bid Price, is considered to be seriously unbalanced, or front loaded, in the opinion of the Procuring Entity, the Procuring Entity may require the Bidder to produce detailed rate analysis for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those rates with the construction methods and schedule proposed. After evaluation of the rate analysis, taking into consideration, the schedule of estimated Contract payments, the Procuring Entity may require that the amount of the Performance security be increased at the cost of the Bidder to a level sufficient to protect the Procuring Entity against financial loss in the event of default of the successful Bidder under the Contract.
5.11	Comparison of Bids	5.11.1	The Procuring Entity shall compare all substantially responsive Financial Bids to determine the lowest-evaluated Financial Bid in accordance with ITB Sub-Clause 5.10 [Evaluation of Financial Bids].

5.12	Negotiations	5.12.1	To the extent possible, no negotiations shall be conducted after the pre-Bid stage. All clarifications needed to be sought shall be sought in the pre-Bid stage itself.
		5.12.2	Negotiations may, however, be undertaken only with the lowest Bidder under the following circumstances- <ul style="list-style-type: none"> i. when ring prices have been quoted by the Bidders for the subject matter of procurement; or ii. when the rates quoted vary considerably and considered much higher than the prevailing market rates.
		5.12.3	The Bid evaluation committee shall have full powers to undertake negotiations. Detailed reasons and results of negotiations shall be recorded in the proceedings.
		5.12.4	The lowest Bidder shall be informed about negotiations in writing either through messenger or by registered letter and e-mail (if available). A minimum time of seven days shall be given for calling negotiations. In case of urgency, the Bid evaluation committee, after recording reasons, may reduce the time, provided the lowest Bidder has received the intimation and consented to holding of negotiations.
		5.12.5	Negotiations shall not make the original offer made by the Bidder inoperative. The Bid evaluation committee shall have option to consider the original offer in case the Bidder decides to increase rates originally quoted or imposes any new terms or conditions.
		5.12.6	In case of non-satisfactory achievement of rates from lowest Bidder, the Bid evaluation committee may choose to make a written counter offer to the lowest Bidder and if this is not accepted by him, the committee may decide to reject and re-invite Bids or to make the same counter-offer first to the second lowest Bidder, then to the third lowest Bidder and so on in the order of their initial standing in the bid evaluation and work order be awarded to the Bidder who accepts the counter-offer.
		5.12.7	In case the rates even after the negotiations are considered very high, fresh Bids shall be invited.
5.13	Procuring Entity's Right to Accept Any Bid, and to Reject Any or All Bids	5.13.1	The Procuring Entity reserves the right to accept or reject any Bid, and to annul the Bidding process and reject all Bids at any time prior to Contract award without assigning any reasons thereof and without there by incurring any liability to the Bidders.
6. Award of Contract			

6.1	Procuring Entity's Right to Vary Quantities	6.1.1	If the Procuring Entity does not procure any subject matter of procurement or procures less than the quantity specified in the Bidding Document due to change in circumstances, the Bidder shall not be entitled for any claim or compensation except otherwise provided in the Bidding Document.
		6.1.2	Order for additional quantity of an item of the Works upto 50 percent of the original quantity of that item in the Bill of Quantities and for extra items not provided for in the Bill of Quantities may be given but the amount of the additional quantities and extra items, taken together, shall not exceed 50 percent of the Contract Price.
6.2	Acceptance of the successful Bid and award of contract	6.2.1	The Procuring Entity after considering the recommendations of the Bid Evaluation Committee and the conditions of Bid, if any, financial implications, samples, test reports, etc., shall accept or reject the successful Bid.
		6.2.2	Before award of the Contract, the Procuring Entity shall ensure that the price of successful Bid is reasonable and consistent with the required specifications.
		6.2.3	A Bid shall be treated as successful only after the competent authority has approved the procurement in terms of that Bid.
		6.2.4	The Procuring Entity shall award the contract to the Bidder whose offer has been determined to be the lowest in accordance with the evaluation criteria set out in the Bidding Document if the Bidder has been determined to be qualified to perform the contract satisfactorily on the basis of qualification criteria fixed for the Bidders in the Bidding Document for the subject matter of procurement.
		6.2.5	Prior to the expiration of the period of validity of Bid, the Procuring Entity shall inform the successful Bidder in writing, by registered post or email, that its Bid has been accepted.
		6.2.6	If the issuance of formal letter of acceptance (LOA) is likely to take time, in the meanwhile a Letter of Intent (LOI) may be sent to the Bidder. The acceptance of an offer is complete as soon as the letter of acceptance or letter of intent is posted and/ or sent by email (if available) to the address of the Bidder given in the Bidding Document.
6.3	Signing of Contract	6.3.1	In the written intimation of acceptance of its Bid sent to the successful Bidder, it shall also be requested to execute an agreement in the format given in the Bidding Document on a non-judicial stamp of requisite value at his cost and deposit the Performance Security or a Performance Security Declaration, if applicable, within a period specified in the BDS or where the period is not specified in the BDS, then within fifteen days from the date on which the LOA or LOI is

			dispatched to the Bidder. In case the successful bidder is a JV still to be legally constituted, all parties to the JV shall sign the Agreement.
		6.3.2	If the Bidder, whose Bid has been accepted, fails to sign a written procurement contract or fails to furnish the required Performance Security or Performance Security Declaration within the specified time period, the Procuring Entity shall forfeit the Bid Security of the successful bidder / execute the Bid Securing Declaration and take required action against it as per the provisions of the Act and the Rules.
		6.3.3	The Bid Security, if any, of the Bidders whose Bids could not be accepted shall be refunded soon after the contract with the successful Bidder is signed and his Performance Security is obtained. Until a formal contract is executed, LOA or LOI shall constitute a binding contract.
6.4	Performance Security	6.4.1	Performance Security shall be solicited from the successful Bidder except State Govt. Departments and undertakings, corporations, autonomous bodies, registered societies, co-operative societies which are owned or controlled or managed by the State Government and undertakings of Central Government. However, a Performance Security Declaration shall be taken from them. The State Government may relax the provision of Performance Security in particular procurement.
		6.4.2	(i) The amount of Performance Security shall be ten percent, or as specified in the BDS, of the amount of the Work Order. The currency of Performance Security shall be Indian Rupees, if otherwise not specified in BDS. (ii) If the Bid, which results in the lowest evaluated bid price, is seriously unbalanced or front loaded in the opinion of the Procuring Entity, the Procuring Entity may require the Bidder to produce detailed price analysis for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analysis, taking into consideration the schedule of estimated Contract payments, the Procuring Entity may require that the amount of the performance security be increased (to a maximum of 20% of the bid value of such items) at the expense of the Bidder to a level sufficient to protect the Procuring Entity against financial loss in the event of default of the successful Bidder under the Contract.
		6.4.3	Performance Security shall be furnished in one of the following forms as applicable- (a) Deposit through eGRAS; or

			<p>(b) Bank Draft or Banker's Cheque of a Scheduled Bank in India; or</p> <p>(c) National Savings Certificates and any other script/ instrument under National Savings Schemes for promotion of small savings issued by a Post Office in Rajasthan, if the same can be pledged under the relevant rules. They shall be accepted at their surrender value at the time of Bid and formally transferred in the name of the Procuring Entity with the approval of Head Post Master; or</p> <p>(d) Bank guarantee. It shall be got verified from the issuing bank. Other conditions regarding bank guarantee shall be same as specified in ITB Sub-Clause 3.10 [Bid Security]; or</p> <p>(e) Fixed Deposit Receipt (FDR) of a Scheduled Bank. It shall be in the name of the Procuring Entity on account of Bidder and discharged by the Bidder in advance. The Procuring Entity shall ensure before accepting the Fixed Deposit Receipt that the Bidder furnishes an undertaking from the bank to make payment/ premature payment of the Fixed Deposit Receipt on demand to the Procuring Entity without requirement of consent of the Bidder concerned. In the event of forfeiture of the Performance Security, the Fixed Deposit shall be forfeited along with interest earned on such Fixed Deposit.</p> <p>(f) The successful Bidder at the time of signing of the Contract agreement, may submit option for deduction of Performance Security from his each running and final bill @ 10% of the amount of the bill.</p>
		6.4.4	Performance Security furnished in the form of a document mentioned at options (a) to (e) of Sub-Clause 6.4.3 above, shall remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the Bidder, including operation and / or maintenance and defect liability period, if any.
		6.4.5	Failure of the successful Bidder to submit the above-mentioned Performance Security or sign the Contract shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security. In that event the Procuring Entity may either cancel the procurement process or if deemed appropriate, award the Contract at the rates of the lowest Bidder, to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Procuring Entity to be qualified to perform the Contract satisfactorily.
		6.4.6	Forfeiture of Performance Security: Amount of Performance Security in full or part may be forfeited in the following cases:-

			<ul style="list-style-type: none"> i. when the Bidder does not execute the agreement in accordance with ITB Clause 6.3 [Signing of Contract] within the specified time; after issue of letter of acceptance; or ii. when the Bidder fails to commence the Works as per Work order within the time specified; or iii. when the Bidder fails to complete Contracted Works satisfactorily within the time specified; or iv. when any terms and conditions of the contract is breached; or v. to adjust any established dues against the Bidder from any other contract with the Procuring Entity; or vi. if the Bidder breaches any provision of the Code of Integrity prescribed for the Bidders specified in the Act, Chapter VI of the Rules and this Bidding Document. vii. Notice of reasonable time will be given in case of forfeiture of Performance Security. The decision of the Procuring Entity in this regard shall be final.
7. Redressal of Grievances during Procurement Process (Appeals)			
7	Grievance handling procedure during procurement process	7.1	Any grievance of a Bidder pertaining to the procurement process shall be by way of filing an appeal to the First or Second Appellate Authority, as the case may be, as specified in the BDS, in accordance with the provisions of chapter III of the Act and chapter VII of the Rules and as given in Appendix A to these ITB.

Appendix A: Grievance Handling Procedure during Procurement Process (Appeals)

(1) Filing an appeal.- If any Bidder or prospective Bidder is aggrieved that any decision, action or omission of the Procuring Entity is in contravention to the provisions of the Act or the Rules or the Guidelines issued there under, he may file an appeal to First or Second Appellate Authority, as the case may be, as may be designated for the purpose, within a period of ten days or such other period as may be specified in the pre-qualification documents, Bidder registration documents or Bidding documents, as the case may be, from the date of such decision or action, omission, as the case may be, clearly giving the specific ground or grounds on which he feels aggrieved:

Provided that after the declaration of a Bidder as successful in terms of section 27 of the Act, the appeal may be filed only by a Bidder who has participated in procurement proceedings:

Provided further that in case a Procuring Entity evaluates the technical Bid before the opening of the financial Bid, an appeal related to the matter of financial Bid may be filed only by a Bidder whose technical Bid is found to be acceptable.

(2) Appeal not to lie in certain cases. -No appeal shall lie against any decision of the Procuring Entity relating to the following matters, namely:-

- a) determination of need of procurement;
- b) provisions limiting participation of Bidders in the Bid process;
- c) the decision of whether or not to enter into negotiations;
- d) cancellation of a procurement process;
- e) applicability of the provisions of confidentiality.

(3) Form of Appeal.-

- a) An appeal under sub-section (1) or (4) of section 38 shall be in the annexed Form along with as many copies as there are respondents in the appeal.
- b) Every appeal shall be accompanied by an order appealed against, if any affidavit verifying the facts stated in the appeal and proof of payment of fee.
- c) Every appeal may be presented to First Appellate Authority or Second Appellate Authority, as the case may be, in person or through registered post or authorized representative.

(4) Fee for filing appeal.-

- a) Fee for first appeal shall be rupees two thousand five hundred and for second appeal shall be rupees ten thousand, which shall be non-refundable.
- b) The fee shall be paid in the form of bank demand draft or banker's Cheque of a Scheduled Bank payable in the name of Appellate Authority concerned.

(5) Procedure for disposal of appeals.-

- a) The First Appellate Authority or Second Appellate Authority, as the case may be, upon filing of appeal, shall issue notice accompanied by copy of appeal, affidavit and documents, if any, to the respondents and fix date of hearing.

- b) On the date fixed for hearing, the First Appellate Authority or Second Appellate Authority, as the case may be, shall,
 - (i) hear all the parties to appeal present before him; and

 - (ii) peruse or inspect documents, relevant records or copies thereof relating to the matter.

- c) After hearing the parties, perusal or inspection of documents and relevant records or copies thereof relating to the matter, the Appellate Authority concerned shall pass an order in writing and provide the copy of order to the parties to appeal free of cost.

- d) The order passed under sub-clause (c) above shall be placed on the State Public Procurement Portal.

Annexure

FORM No. 1

[See rule 83]

Memorandum of Appeal under the Rajasthan Transparency in Public Procurement Act, 2012

Appeal Noof

Before the (First / Second Appellate Authority)

1. Particulars of appellant:

(i) Name of the appellant:

(ii) Official address, if any:

(iii) Residential address:

2. Name and address of the respondent(s):

(1).

(2). (3).

3. Number and date of the order appealed against and name and designation of the officer / authority who passed the order (enclose copy), or a statement of a decision, action or omission of the Procuring Entity in contravention to the provisions of the Act by which the appellant is aggrieved:

4. If the Appellant proposes to be represented by a representative, the name and postal address of the representative:

5. Number of affidavits and documents enclosed with the appeal:

6. Grounds of appeal:

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.....
.....

..... (Supported by an affidavit)

7. Prayer:

.....
.....
.....

Place

Date.....

Appellant's Signature

SECTION-II: BIDDING DATA

SECTION-II: BIDDING DATA

The following specific data for the works shall complement, amend, or supplement the provisions in Instructions to Bidders – Section I. Whenever there is a conflict, the provisions herein shall prevail over those in the Instructions to Bidders.

Instructions to Bidders Clause Reference

A. Introduction

ITB. 1.1.1	<p>The Number of the Invitation for Bids (NIT) is: 01/2016-17</p> <p>The Procuring Entity is: CEO, KOTA SMART CITY LIMITEDKOTA</p> <p>Name of the works : Development of Dussehra Maiden(Phase-I) Kota with Civil, Electrical, Plumbing, Architectural and Landscaping work including 1 year defect liability and there after 03 years O&M</p> <p>(Detailed Scope of work has been defined in Section 5 of the tender document)</p>
ITB1.1.2	<p>Period of Completion:</p> <p>The Physical Works shall be completed in its entirety within 12 months with a grace period of one month (i. e. the period of Dussehra fair) from the Start Date, which shall be the date of issue of the Notice to proceed or such other Start Date as may be specified in the Notice to proceed. The O&M period shall be of 03 years and shall commence after completion of one year defect liability period.</p>
1.1.3	<p>Estimated Cost of work is as under:</p> <p>Total Cost of Works under Package: Rs. 6426.70Lacs</p>
ITB 1.4.1	<p>Joint Ventures are permitted comprising not more than 2 (two) firms/companies. The minimum equity under JV of lead firm should be 51% and that of other firm should be 25%.</p>
ITB 1.4.2	<p>“Bidders of Indian Nationality” are permissible.</p>
ITB 1.4.5	<p>The Bidder / both of the partners of JV must be registered Contractor in AA class of the department / organization of any State Govt./ Central Govt. / PSU / Govt Autonomous Body / Govt. Undertaking of any country. He shall furnish necessary proof for the same.PSU (Indian) can participate in tender without registration.</p>
ITB 1.4.8	<p>The bidding process is open to bidders who fulfil the prescribed eligibility criteria.</p>
ITB 1.4.9	<p>Each bidder shall upload on-line, only.</p>

B. Bidding Documents

ITB 2.1.3	<p>This is an “on-line tender”. Therefore, tender documents in physical form shall not be available for sale but can be downloaded from the website. The bidder shall pay the cost of the bidding document of INR 20,000/- in the form of DD in favour of CEO,</p>
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	<p>Municipal Corporation, payable at Kota and processing fee of INR 1,000/- in form of DD in favour of MD, RISL, Jaipur.</p> <p>The bidder should submit, by date & time specified in bid document, in original, hard copies of – (i) cost of the bidding document of INR 20,000/- in the form of DD/Banker's Cheque of a scheduled bank (as per list of RBI) in the name of The CEO, Municipal Corporation, payable at Kota (ii) Bid processing fee of INR 1,000/- in the form of DD/Banker's Cheque of a scheduled bank (as per list of RBI) in the name of Managing Director, RISL, Jaipur payable at Jaipur; (iii) Earnest Money as per RTPP; (iv) Letter of Technical Bid; (v) Power of Attorney; and (vi) Joint Venture Agreement, if applicable at Room No. 223 of KOTA SMART CITY LIMITED.</p>
ITB 2.1.4	The Procuring Entity or the Representative is not responsible for the completeness of the Bidding Document and its addenda, if they were not downloaded correctly from the e-procurement portal or the State Public Procurement Portal.
ITB 2.2.1	<p>For Clarification purposes only, the Representative address is :</p> <p>OFFICE OF THE CEO</p> <p>KOTA SMART CITY LIMITED Kota (Rajasthan)</p> <p>Rajeev Gandhi Bhawan Dushera Ground Kota</p> <p>EMAIL: nnkota@gmail.com</p> <p>PHONE: 0744-2500197; FAX:</p> <p>Contact Person: Mr. Shiv M Nakata (M) +91-9530301400, Mr. B. Mathur, Superintending Engineer (M) +91-7891512444. and Mr Prashant Bhardwaj, Executive Engineer (M) +91-7726097743</p>
ITB 2.2.2	<p>A Pre-bid Meeting will take place at the Room No.- 202, KOTA SMART CITY LIMITED Kota on:</p> <p>Date : 03.01.17</p> <p>Time : 12:00 Noon</p> <p>No Site visit shall be organised by the procuring entity. However, bidders are advised to visit the sites at their own expenses and if any support is required, shall be provided by the CEO/Executive Engineer.</p>
ITB 2.2.3	The Bidders are requested, to submit questions in writing, to reach the Representative preferably not later than one week before the Pre-bid Meeting. However, Department may also consider questions / queries raised in writing only, during the Pre-bid Meeting.
ITB 2.2.4	Minutes of the Pre-Bid Conference, including the text of the questions raised, and the responses given, without identifying the source, will be transmitted promptly to all Bidders who attended the Pre-Bid Conference and shall also be placed on the State Public Procurement Portal and the e-procurement portal. Any modification to the Bidding Document that may become necessary as a result of the Pre-Bid Conference shall be made by the Representative through the issue of an addendum (part of Bid document) and not through the minutes of the Pre-Bid Conference.
ITB 2.2.5	At any time prior to the deadline for submission of the Bids, the Procuring Entity through its representative, suo motto, may also amend the Bidding Document, if

	required, by issuing an addenda which will form part of the Bidding Document.
ITB 2.3.1	All clarifications & Minutes of Pre bid meeting, any addendum/corrigendum issued shall be part of the Bidding Document and shall be uploaded on the State Public Procurement Portals http://sppp.rajasthan.gov.in/ and http://eproc.rajasthan.gov.in
ITB 2.3.2	To give prospective Bidders reasonable time in which to take an addendum into account in preparing their Bids, the Procuring Entity through its representative may, at its discretion, extend the deadline for the submission of the Bids, pursuant to ITB Sub-Clause 4.2 [Deadline for Submission of Bids], under due intimation to the Bidders by uploading it on the State Public Procurement Portal and its e-procurement portal.

C. Preparation of Bids

ITB 3.2.1	The language of the bid shall be: English
ITB 3.3.1	The online Bid shall comprise of two parts submitted simultaneously, one containing the Technical Bid/ Proposal and the other the Financial or Price Bid/ Proposal.
ITB 3.3.2	The Bidder shall submit the forms, declarations and documents, as specified in section IV of Bid Document, with the Technical Bid:
ITB 3.3.3	The Bidder shall upload the following documents with its Financial Bid: <ul style="list-style-type: none"> a) Financial Proposal Submission Sheet/BOQ b) Preamble to BOQ c) And other details as mentioned in Sec 4 of Vol-01
ITB 3.5.1	Add following: <ul style="list-style-type: none"> a) The type of Contract is combination of Percentage Rate (G-Schedule) and Item Rate (H-Schedule) basis for Sewerage Network and on Lump-sum basis for Sewage Pumping Station/Manhole with Pump and for Sewage Treatment Plants. Contract Price should be sum of capital cost(Civil, Road, Electrical, water supply, waste water, FIRE FIGHTING WORKS, HORTICULTURE WORKS, STREET FURNITURE & OTHERS) + O&M cost b) The first year after completion of all physical works and issue of completion certificate shall be the Defects Liability Period. The O&M period of all the works under this contract shall be 03 years after completion of the one year defect liability period. Thus the total O&M period shall be 04 years. No payment against O&M shall be made to the contractor during the Defect Liability Period. The annual / yearly O&M charges of all facilities created under the Contract shall be fixed and shall be as specified in the BOQ/Tender Document. O&M charges include all expenditures and expenses required to be incurred on labour, machinery deployed, repair and/or replacement of material, preventive and/or breakdown maintenance including cost of material/equipment/machinery, consumable items, chemicals, fuel, water and all other matters and things of what so ever nature essential and desirable to run the entire project area satisfactorily (the O&M charges do not include power charges which shall be paid by the department)

ITB 3.5.2	The Prices quoted by the Bidder shall be a Gross Percentage rate above/ below/at par for the BOQ attached. Provision of Price escalation shall be as per Conditions of Contract.
ITB 3.5.3	All variations in taxes and duties including GST shall be borne by the contractor.
ITB 3.7.1	To establish their eligibility in accordance with ITB Clause 1.4 [Eligible Bidders], Bidders shall: complete the eligibility declarations in the Bid Submission Sheet and Declaration Form included in Section IV [Bidding Forms]; if the Bidder is an existing or intended Joint Venture [JV], Consortium or Association in accordance with ITB Sub-Clause 1.4.1, shall submit a copy of the Agreement, or a letter of intent to enter into such Agreement. The respective document shall be signed by all legally authorized signatories of all the parties to the existing or intended JV, Consortium or Association as appropriate; and the existing or intended JV shall authorize an individual/ <u>lead partner</u> in one of the firms as lead partner of the JV to act and commit all the <u>partners</u> of JV for the Bid.
ITB 3.9.1	The Bid validity period shall be 90 (Ninty days) days from deadline for submission of bids.
ITB 3.9.2	In exceptional circumstances, prior to the expiration of the Bid validity period, the representative may request Bidders to extend the period of validity of their Bids. The request and the responses shall be made in writing. The Earnest Money or a Bid Securing Declaration in accordance with ITB Clause 3.10 [Bid Security] shall also be got extended for thirty days beyond the dead line of the extended validity period. A Bidder may refuse the request without forfeiting its Earnest Money or a Bid Securing Declaration. A Bidder granting the request shall not be permitted to modify its Bid.
ITB 3.10.2	Add following: Earnest Money shall be of the value Rs. 128.54 Lacs (Rupees One Crore twenty eight lac fifty four thousand only), as indicated in NIB for all bidders.
ITB 3.10.3	The bidder shall pay the cost of the bidding document of INR 20,000/- in the form of DD/Banker's Cheque of a scheduled bank (as per list of RBI) in the name of the CEO, Municipal Corporation, payable at Kota DD and processing fee of INR 1,000/- in form of in the form of DD/Banker's Cheque of a scheduled bank (as per list of RBI) in the name of MD, RISL, Jaipur. The original DDs shall be physically submitted in the office of the CEO, KOTA SMART CITY LIMITED, Kota before the last date & time of submission of depositing documents in hard copy at Room No. 223 in KOTA SMART CITY LIMITED Office and their scanned copies shall be uploaded with the technical bid.
ITB 3.10.6	Earnest Money of a Bidder lying with the Procuring Entity's Representative in respect of other Bids awaiting decision shall not be adjusted towards Earnest Money for the this Bid. The Earnest Money originally deposited may, however be taken into consideration in case Bids are re-invited.
ITB 3.10.8	Prior to submitting its Bid, a Bidder may request the Representative to confirm the acceptability of a proposed issuer of a Earnest Money or of a proposed confirmer,

	if different than as specified in ITB Clause 3.10.3. The Representative shall respond promptly to such a request.
ITB 3.10.9	The bank guarantee presented as Earnest Money shall be got confirmed from the concerned issuing bank. However, the confirmation of the acceptability of a proposed issuer or of any proposed confirmer does not preclude the Representative from rejecting the Earnest Money on the ground that the issuer or the confirmer, as the case may be, has become insolvent or is under liquidation or has otherwise ceased to be creditworthy.
ITB 3.10.13	The Representative shall promptly refund the Earnest Money of the Bidders at the earliest of any of the following events, namely:- v. the expiry of validity of Earnest Money; vi. the execution of agreement for procurement and Performance Security is furnished by the successful bidder; vii. the cancellation of the procurement process; or the withdrawal of Bid prior to the deadline for presenting Bids, unless the Bidding Document stipulates that no such withdrawal is permitted.
ITB 3.11.1	Only Digital signed Bids shall be submitted through e-procurement website.
ITB 3.11.2	The written confirmation of authorization to sign on behalf of the Bidder shall consist of : Power of Attorney

D. Submission and Opening of Bids

ITB 4.1.1	<p>Bidders shall submit their Bids to “the Representative” on-line only. “The Representative’s” address for bid submission is:</p> <p>OFFICE OF THE CEO KOTA SMART CITY LIMITED Kota (Rajasthan) Rajeev Gandhi Bhawan Dushera Ground Kota EMAIL: nnkota@gmail.com PHONE: 0744-2500197; FAX:</p> <p>Bidders shall submit their Bids electronically only (The Documents uploaded shall only be considered. No physical submission of documents is acceptable except the documents specified in Clause 2.1.3).</p> <p>The Bidders shall submit the Bid online with all pages numbered serially and by giving an index of submissions. Each page of the submission shall be initialled by the Authorised Representative of the Bidder as per the terms of the tender. The Bidder shall be responsible for documents accuracy and correctness as per the Bid document uploaded by the Representative and shall ensure that there are no changes caused in the content of the downloaded document. The bidder shall follow the following instructions for online submission:</p> <ul style="list-style-type: none"> • Bidder who wants to participate in bidding will have to procure digital certificate as per IT Act to sign their electronic bids. Offers which are not digitally signed will not be accepted. Bidder shall submit their offer in electronic format on
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	<p>above mentioned website after digitally signing the same.</p> <ul style="list-style-type: none"> • Cost of bid document is Rs.20,000/-, whereas the Bid Processing fee is Rs. 1,000/-. • The Procuring Entity or the Representative will not be responsible for any mistake occurred at the time of uploading of bid or thereafter. • If holiday is declared on physical submission (depositing documents in hard copy) & opening date of tender the scheduled activity will take place on next working day. • Bids are required to be submitted on-line, it shall be submitted/uploaded on the e-procurement portal of state government :http://eproc.rajasthan.gov.in. The Earnest Money shall be paid in the name of “the Representative” as stipulated in tender document.
ITB 4.2.1	<p>The Deadline for on-line Bid submission is</p> <p><u>Date: 15.01.2017</u></p> <p><u>Time: 06:00 PM</u></p>
ITB 4.3.1	<p>A Bidder may withdraw, substitute or modify its Bid after it has been submitted by submitting electronically on the e-procurement portal a written Withdrawal/ Substitutions/ Modifications etc. Notice on the e-procurement portal, duly digitally signed by the Bidder or his authorized representative, and shall include a copy of the authorization in accordance with ITB Sub-Clause 3.11.1 [Format and Signing of Bid]. The corresponding Withdrawal, Substitution or Modification of the Bid must accompany the respective written Notice. All Notices must be received by the Representative on the e-procurement portal prior to the deadline specified for submission of Bids in accordance with ITB Sub-Clause 4.2. [Deadline for Submission of Bids].</p>
ITB 4.4.1	<p>The on-line Technical Bids shall be opened by the Bids opening committee constituted by <u>the Representative</u> in the presence of the Bidders or their authorized representatives, who choose to be present. The online Bid opening shall take place <u>at 12:00 noon on 16.01.2017 at:</u></p> <p>OFFICE OF THE EXECUTIVE DIRECTOR</p> <p>OFFICE OF THE CEO</p> <p>KOTA SMART CITY LIMITED Kota (Rajasthan)</p> <p>Rajeev Gandhi Bhawan Dushera Ground Kota</p> <p>EMAIL: nnkota@gmail.com</p> <p>PHONE: 0744-2500197; FAX:</p> <p>The tendering process shall be conducted on-line only; DD/BC for the tender fee processing fee and Earnest Money in form of Bank Guarantee shall be submitted physically up to deadline described in tender document.</p>
ITB 4.4.4	<p>The Financial Bids shall be kept unopened until the time of opening of the Financial Bids. The date, time, and location of electronic opening of the Financial Bids shall be intimated to the bidders who are found responsive by the Representative in evaluation of their Technical Bids.</p>

ITB 4.4.10	After completion of the evaluation of the Technical Bids, the Representative shall invite Bidders who have submitted substantially responsive Technical Bids and who have been determined as being qualified to attend the electronic opening of the Financial Bids. The date, time, and location of the opening of Financial Bids will be intimated in writing by the representative. Bidders shall be given reasonable notice of the opening of Financial Bids.
ITB 4.4.11	The Representative shall notify Bidders in writing whose Technical Bids have been rejected on the grounds of being substantially non-responsive and not qualified in accordance with the requirements of the Bidding Document.
ITB 4.4.12	The Bids opening committee shall conduct the electronic opening of Financial Bids of all Bidders who submitted substantially responsive Technical Bids and have qualified in evaluation of Technical Bids, in the presence of Bidders or their representatives who choose to be present at the address, date and time specified by the Representative as per e-tendering procedure.
ITB 5.1.4	In addition to the restrictions specified in section 49 of the Act, the Procuring Entity through its Representative , while procuring a subject matter of such nature which requires the procuring Entity through its Representative to maintain confidentiality, may impose condition for protecting confidentiality of such information.
ITB 5.4.2	Provided that a Technical or Financial Bid is substantially responsive, “The Representative” may request the Bidder to submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities or omissions in the Bid related to documentation requirements. Request for information or documentation on such nonconformities shall not be related to any aspect of the Financial Proposal of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.
ITB 5.4.3	<p>* Provided that a Technical or Financial Bid is substantially responsive, “the Representative” will rectify nonmaterial nonconformities or omissions (with recorded reasons). To this effect, the Bid Price shall be adjusted during evaluation of Financial Proposals for comparison purposes only, to reflect the price of the missing or non- conforming item or component. The adjustment shall be made using the method indicated in Section III, Evaluation and Qualification Criteria.</p> <p>* [This ITB Sub-Clause should be kept only when considered necessary]</p>
ITB 5.5.1	<p>Provided that a Financial Bid is substantially responsive, the Bid evaluation committee shall correct arithmetical errors during evaluation of Financial Bid on the following basis:</p> <ul style="list-style-type: none"> i. if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Procuring Entity or its Representative there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected; ii. if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

	iii. if there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (i) and (ii) above.
ITB 5.6.1	“The Representative” shall examine the Technical or Financial Bids to confirm that all documents and technical documentation requested in ITB Sub-Clause 3.3 [Documents Comprising the Bid] have been provided, and to determine the completeness of each document submitted.
ITB 5.6.2	All documents as stated in NIB to be submitted in physical form but the prospective bidder up to stipulated date and time as indicated in detailed NIB.
ITB 5.7.1	“The Representative” determination of the responsiveness of a Technical or Financial Bid is to be based on the contents of the Bid itself, as defined in ITB Sub-Clause 3.3 [Documents Comprising the Bid].
ITB 5.7.4	If a Technical or Financial Bid is not substantially responsive to the Bidding Document, it shall be rejected by the Representative and may not subsequently be made responsive by the Bidder by correction of the material deviation, reservation, or omission.
ITB 5.8.1	“The Representative” shall examine the Bids to confirm that all terms and conditions specified in the GCC and the SCC have been accepted by the Bidder without any material deviation or reservation.
ITB 5.8.2	“The Representative” shall evaluate the technical aspects of the Bid submitted in accordance with ITB Clauses 3.3 [Documents Comprising the Bid] and to confirm that all requirements specified in Section V [Procuring Entity’s Requirements] of the Bidding Document and all amendments or changes requested by the Representative in accordance with ITB Clause 2.3 [Amendment of Bidding Document] have been met without any material deviation or reservation.
ITB 5.10.1	“The Representative” shall evaluate each Financial Bid, the corresponding Technical Bid of which has been determined to be substantially responsive
ITB 5.10.2	To evaluate a Financial Bid, “the Representative” shall only use all the criteria and methodologies defined in this Clause and in Section III, Evaluation and Qualification Criteria. No other criteria or methodology shall be permitted.
ITB 5.10.3	To evaluate a Financial Bid, “the Representative” shall consider the following: <ul style="list-style-type: none"> iv. the Bid Price quoted in the Financial Bid; v. price adjustment for correction of arithmetical errors in accordance with ITB Clause 5.5 [Correction of Arithmetical Errors]; <p>Adjustment of bid prices due to rectification of nonmaterial nonconformities or omissions in accordance with ITB Sub Clause 5.4.3 [Nonmaterial Nonconformities in Bids], if applicable.</p>
ITB 5.10.4	If the Bid, which results in the lowest evaluated Bid Price, is considered to be seriously unbalanced, or front loaded, in the opinion of the Procuring Entity or its Representative, the Procuring Entity or its Representative may require the Bidder to produce detailed rate analysis for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those rates with the construction methods

	and schedule proposed. After evaluation of the rate analysis, taking into consideration, the schedule of estimated Contract payments, the Procuring Entity or its Representative may require that the amount of the Performance security be increased at the cost of the Bidder to a level sufficient to protect the Procuring Entity or its Representative against financial loss in the event of default of the successful Bidder under the Contract.
ITB 5.11.1	“The Representative” shall compare all substantially responsive Financial Bids to determine the lowest-evaluated Financial Bid in accordance with ITB Sub-Clause 5.10 [Evaluation of Financial Bids].
ITB 5.13.1	The Procuring Entity or its Representative reserves the right to accept or reject any Bid, and to annul the Bidding process and reject all Bids at any time prior to Contract award without assigning any reasons thereof and without there by incurring any liability to the Bidders.

E. Award of Contract

ITB 6.2.1	The Procuring Entity or its Representative after considering the recommendations of the Bid Evaluation Committee and the conditions of Bid, if any, financial implications, samples, test reports, etc., shall accept or reject the successful Bid.
ITB 6.2.2	Before award of the Contract, the Procuring Entity or its Representative shall ensure that the price of successful Bid is reasonable and consistent with the required specifications.
ITB 6.2.6	<u>ADD</u> The LOA, NTP and Agreement shall be issued by Municipal Corporation, Kota.
ITB 6.3.1	<u>ADD</u> The period within which the Performance Security is to be submitted by the successful Bidder and the Contract Agreement is to be signed by him from the date of issue of Letter of Acceptance is 15 Days. Contract Agreement has to be signed with the Procuring Entity, i.e., KOTA SMART CITY LIMITED. The performance security shall be submitted of value 10% of the contract value.
ITB 6.3.2	If the Bidder, whose Bid has been accepted, fails to sign a written procurement contract or fails to furnish the required Performance Security or Performance Security Declaration within the specified time period, the Representative shall forfeit the Earnest Money of the successful bidder / execute the Bid Securing Declaration and take required action against it as per the provisions of the Act and the Rules.
ITB 6.3.3	“The Representative” shall promptly return the Earnest Money after the earliest of the following events, namely: <ol style="list-style-type: none"> 1. The expiry of validity of Earnest Money 2. The execution of agreement for procurement and performance security is furnished by the successful bidder; 3. The cancellation of the procurement process; or 4. The withdrawal of bid prior to the deadline for presenting bids, unless the

	bidding documents stipulate that no such withdrawal is permitted.
ITB 6.4.2, 6.4.3, 6.4.4 Replace with following	<p>Performance Security amounting to total 10% of contract value (but excluding O&M cost and provisional sum) shall be submitted / deducted as follows:</p> <p>(i) Contractor shall submit Performance Security @ 10% in advance at the time of signing of agreement in form of Bank Guarantee as per latest rules under RTPP act. The Bank Guarantee should be issued by any nationalized/ schedule bank and shall remain valid up to 60 days beyond defect liability period. Bank Guarantee submitted against the performance guarantee, shall be unconditional and en-cashable/ invokable at Kota.</p> <p>(ii) If there is no reason to retain the Performance Security, it shall be returned back to the contractor within 60 days after the satisfactory completion of the defect liability period, subject to submission of fresh Performance Security valid for the entire O&M period, of an amount 5% of total contract value (but excluding O&M cost and provisional sum) or 50% of the total O&M cost, whichever is higher.</p> <p>(iii) Refer clause 4.3.1 of Special conditions of contract.</p>
ITB 6.4.5	Failure of the successful Bidder to submit the above-mentioned Performance Security or sign the Contract shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security. In that event the Representative may either cancel the procurement process or if deemed appropriate, award the Contract at the rates of the lowest Bidder, to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Representative to be qualified to perform the Contract satisfactorily.
ITB 7.1	First Appellate Authority shall be: Dy. Secretary/Joint secretary, LSGD, Rajasthan Second Appellate Authority shall be: Secretary/Principal Secretary, LSGD, Rajasthan

SECTION III: EVALUATION AND QUALIFICATION CRITERIA

A. Evaluation Criteria

1.1 The successful Bid will be the lowest evaluated responsive Bid, which qualifies technical evaluation.

1.2 Adequacy of Technical Proposal

Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail.

1.3 Quantifiable Nonconformities, Errors and Omissions.

The evaluated cost of quantifiable non conformities, errors and/or omissions is determined as follows:

"Pursuant to ITB Clause 5.4, the cost of all quantifiable nonmaterial nonconformities or omissions shall be evaluated. The Procuring Entity will make its own assessment of the cost of any nonmaterial nonconformities and omissions for the purpose of ensuring fair comparison of bids."

[For guidance: The cost of minor omissions or missing items should be added to the Bid Price to allow for bid comparison on an equal basis. The price adjustment should be based on a reasonable estimate of the cost by the executing agency, engineer, consultant or bid evaluation committee, taking into consideration the corresponding quoted prices from other conforming bids. The price adjustment may be based on the price of the item quoted by the next lowest qualified bidder].

B. Qualification Criteria:-

1. Eligibility:

	Criteria	Compliance Requirements			
		Single Entity	Joint Venture		
	Requirement		All Partners Combined	Each Partner	One partner
i) Nationality	National	Must meet requirement	Must meet requirement	Must meet requirement	Must meet requirement
ii) Conflict of Interest	No conflicts of interest in accordance with ITB Sub-clause 1.4.3	Must meet requirement	Must meet requirement	Must meet requirement	Must meet requirement
iii) Debarment/ Transgression by any Procuring Entity.	Must declare	Must meet requirement	Must meet requirement	Must meet requirement	Must meet requirement

2. Pending Litigation:

Pending Litigation	All pending litigation shall be treated as resolved against the Bidder and so shall in total not represent more than 50 percent of the Bidder's net worth.	Must meet requirement by itself	N/A	Must meet requirement by itself	N/A
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NOTE: CA shall clearly mention in his certificate with all calculations that pending litigation in total is not more than 50% of Bidder's net worth.

3. Experience:

Experience of construction contracts in the role of contractor for at least last 5 Years prior to the Bid submission deadline.

1. .

	Criteria	Compliance Requirements			
		Single Entity	Joint Venture		
	Requirement			All Partners Combined	Each Partner	One partner
i) Experience of construction contracts (2011-12 to 2015-16 and current year)	At least the last 5 Years prior to the Bid submission deadline.	Must meet requirement	N/A	Must meet requirement	N/A

NOTE: Certificate of Chartered Accountant must be submitted, clearly indicating construction experience based on construction turnover of the firm.

2. The bidder should have experience of the following in last five financial years (2011-12 to 2015-16); experience in current year shall also be counted up to deadline for submission of bid:

Criteria	Compliance Requirements			
	Single Entity	Joint Venture (permitted)		
		All Partners Combined	Each Partner	One partner
Requirement				
Should have completed Building/ Public Utility/Horticultural/Infrastructure development / Airport work / but excluding Road and Surface Parking work in all above categories with following sub criteria (a) Two Building / Public Utility / Horticultural / Infrastructure development/Airport work / but excluding Road and Surface Parking work in all above categories completed work costing not less than the amount equal to 25 % of the estimated cost. Or	Must meet requirement	Must meet requirement	NA	NA

(b) One Building / Public Utility / Horticultural / Infrastructure development/Airport work / but excluding Road and Surface Parking work in all above categories completed work costing not less than the amount equal to 50% of the estimated cost.				
---	--	--	--	--

Note:

(i) The completion of the work is essentially required and any hindrance in completion whether within or beyond control of the contractor would not be acceptable.

(ii) Clients certificate of experience must clearly indicate whether

- o **Completed in all respect as per work order**

3. Construction Experience in Key Activities in last 5 years (2011-12 to 2015-16).

Criteria	Compliance Requirements			
	Single Entity	Joint Venture (permitted)		
Requirement			All Partners Combined	Each Partner	One partner
Experience of Minimum Quantity as below:- i. Civil Works :- a) RCC work (M-20 & above) :-3000m ³ b) Road Work :- 13250 m ² c) Cladding work :-2950m ² d) Flooring :- 27500 m ² ii. Electrical Work :- a) 11 KV SUB STATION:-01Nos. iii. HORTICULTURE WORK :- a) Laying of LAWNS:-7950 M ²	Must meet requirement	Must meet requirement	not applicable	not applicable

Note: - The Completion of the work is essentially required and any hindrance in completion whether within or beyond control of the contractor would not be acceptable.

- i) The bidder shall submit copies of work orders in case of PSU agreement/work order), completion and satisfactory performance certificates in support of their experience claims. Only works of Govt. /PSU/ Autonomous bodies under government sector of any country shall be considered.
- ii) The works which have been completed during the period mentioned above, though may have commenced earlier, shall be considered for experience purposes.

- iii) For considering experience of the bidder, out of its experience as JV, its own share/quantum of works in the JV shall be considered with relevant evidence/certificates. In absence of the evidence for partnership ratio in JV agreement, no experience shall be considered.*
- iv) JV shall comprise of not more than two firms/companies. The minimum equity under JV of lead firm must be 51% and that of other firm must be 25%.*
- v) Quantity for qualification shall be evaluated Maximum 05 Nos. Work Order with Completion Certificate and it is not required that all items (Civil, Electrical. Horticultural) shall incorporate in one work order.*

Financial:

Criteria	Compliance Requirements			
	Single Entity	Joint Venture (permitted)		
Requirement		All Partners Combined	Each Partner	One partner
5.1 Historical Financial Performance				
Net Worth:				
Net Worth of the bidder as on last date of previous financial year (of which audited balance sheet is available) shall not be less than 10% of Estimated bid cost (Certificate of Chartered Accountant showing calculation of Net Worth must be enclosed).	Must meet requirement	not applicable	Lead partner Must meet requirement and Net worth of Second partner should be positive	not applicable
Working Capital:				
Working Capital based on the current assets and current liabilities (including the short term loan repayments due in current years) should be 25% of the estimated cost of bid. (Available Working Capital shall be evaluated as Current Assets + Revolving Line of Credit – Current Liabilities (including loan repayment due within one year). <i>NOTE: Certificate of CA must be submitted indicating clearly that the working capital is as per formula given in tender document and clearly stating the individual components. CA must also clearly mention that he has gone through the Revolving line of credit which is issued by scheduled Bank and Bank's commitment is project specific, assured and without any ambiguity and shall be available till final completion of project. For revolving line of credit bank's letter should be attached. The bank issuing revolving line of credit has to be scheduled Bank as per format otherwise it shall not be considered.</i>	Must meet requirement	Must meet requirement	Must meet (25%) requirement	not applicable

5.2 Construction Turnover				
<p>Average Annual construction Turnover of any three years out of last Four years (Financial Year 2013-14 to 2016-17 current year) should be equal to or more than (1.5 x cost of work / time period in years)</p> <p>Audited Balance Sheets of all the three financial years must be submitted in support, without which the bid may not be considered. The calculation sheet for annual average construction turnover shall be certified by a Chartered Accountant.</p>	Must meet requirement	Must meet requirement	Not applicable	Lead member must meet 60 percent of the requirement
5.3 BID CAPACITY:				
<p>Bid Capacity: The bid capacity of the bidder shall not be less than the estimated cost of the bid. The formula for calculating Bid capacity is given here</p> <p>Bid Capacity=(2xAxN)-B</p> <p>Where A= Maximum value of Annual Turnover from Civil Engineering works executed in any one year during the last five years(2011-12, 2012-13, 2013-14, 2014-15, 2015-16) (updated to present price level) taking in to account the completed as well as works in progress (including current year, if opted by the bidder),</p> <p>N=Prescribed completion period of the work for which bids are invited in years,</p> <p>B= Value at present price level (2016-17) of existing commitments and ongoing works to be completed during N period i.e., the period of completion of works for which bids are invited.</p>	Must meet requirement	Must meet requirement	Must meet 25% requirement	Lead member must meet 60 percent of the requirement

NOTE: The certificate of CA regarding Bid Capacity must be submitted otherwise bid shall not be considered. The certificate should clearly show the calculation how the Bid Capacity is calculated as per formula given in tender. The contractor should submit an undertaking on stamp paper of Rs. 500 that he has mentioned all projects necessary for calculation of B value for the calculation of Bid Capacity.

The present price level for turnover and cost of completed work of similar nature, the previous years' value shall be given weight age of 10% per year as follows:

Sr. No	Financial Year	Weight age
--------	----------------	------------

(i)	2016-17	1.00
(ii)	2015-16	1.00
(iii)	2014-15	1.10
(iv)	2013-14	1.21
(v)	2012-13	1.33
(vi)	2011-12	1.46

Section IV: Bidding Forms

Section IV: Bidding Forms

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4.1 TECHNICAL PROPOSAL [WITH REFERENCE TO SECTION III] CHECK LIST

In addition to the forms given in this section, a Technical Proposal must necessarily contain the following; otherwise the bid shall be considered incomplete and may lead to non-responsive.:

1. Notice Inviting Tender
2. CA's certificates
3. Bank's letter as required in Tender Document (if applicable).
4. Sales Tax Registration in State of Rajasthan (Optional),
5. VAT / Sales Tax Clearance Certificate
6. Service Tax Registration, if required as per law
7. Proof of payment of Earnest Money
8. Proof of Cost of bidding document or receipt of such cost.
9. Proof of Bid processing fee as specified.
10. Bid capacity stipulations as required in Tender Document.
11. Completion Certificates of works which have been cited in support of fulfillment of eligibility criteria as specified in Tender Document.
12. Work orders of works which have been cited in support of fulfillment of eligibility criteria as specified in Tender Document.
13. Drawings / designs / technical documents (if required) in support of works to be executed
14. Any modifications or withdrawal.
15. Other documents considered necessary to strengthen the bid.
16. JV agreement against which experience for eligibility is claimed to demonstrate clearly the JV members work in that JV.
17. Registration certificate of each bidder / JV Partner in class AA or equivalent in any State / Central Government/ PSU / in India. PSU (Indian) can participate in tender without registration.

4.2 Letter of Technical Bid

Technical Bid Submission Sheet

Date: _____

NIT No.: _____

To: _____

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Document, including Addenda No. _____

(b) We offer to execute in conformity with the Bidding Document the following Works:

(c) Our Bid shall be valid for a period of 180 days from the date fixed for the bid submission deadline in accordance with the Bidding Document, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(d) If our Bid is accepted, we commit to obtain a Performance Security in the amount of _____ percent of the Contract Price or Performance Security Declaration, as the case may be, for the due performance of the Contract;

(e) Our firm, including any subcontractors or suppliers for any part of the Contract, have nationalities from the eligible countries;

(f) We are not participating, as Bidder, in more than one Bid in this bidding process, other than alternative offers, if permitted, in the Bidding Document;

(g) Our firm, its affiliates or subsidiaries, including any subcontractors or suppliers has not been debarred by the State Government or the Procuring Entity;

(h) We understand that this Bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal Contract is prepared and executed;

(i) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive;

(j) We agree to permit Government of Rajasthan or the Procuring Entity or their representatives to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by the Procuring Entity;

(k) We have paid, or will pay the following commissions, gratuities, or fees, if any, with respect to the bidding process for execution of the Contract:

Name of Recipient	Address	Reason	Amount

(k) We declare that we have complied with and shall continue to comply with the provisions of the Code of Integrity including Conflict of Interest as specified for Bidders in the Rajasthan Transparency in Public Procurement Act, 2012, the Rajasthan Transparency in Public Procurement Rules, 2013 and this Bidding Document during this procurement process and execution of the Works as per the Contract;

(l) Other comments, if any:

Name/ address: _____

In the capacity of: _____

Signed: _____

Duly authorised to sign the Bid for and on behalf of: _____

Date: _____

Tel: _____ Fax: _____

E-mail: _____

4.3.1 Earnest Money (Bank Guarantee Unconditional)*

Form of Earnest Money

[insert Bank's Name, and Address of Issuing Branch or Office]

Beneficiary: [CEO, KOTA SMART CITY LIMITEDKOTA]

Date: *[insert date]*

BID GUARANTEE No.: *[insert number]*

We have been informed that *[insert name of the Bidder]* (hereinafter called "the Bidder") has submitted to you its bid dated *[insert date]* (hereinafter called "the Bid") for the execution of *[insert name of contract]* under Notice Inviting Tender No. *[Insert NIT number]* ("the NIT").

Furthermore, we understand that, according to your conditions, bids must be supported by a bid guarantee.

At the request of the Bidder, we *[insert name of Bank]* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of ----- *[insert amount in figures][insert amount in words]* upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder:

- (a) has withdrawn its Bid during the period of bid validity specified by the Bidder in the Letter of Technical Bid; or
- (b) having been notified of the acceptance of its Bid by the *Procuring Entity/ "The Representative"* during the period of bid validity,
 - (i) fails or refuses to execute the Contract Agreement,
 - (ii) fails or refuses to furnish the performance security, in accordance with the Instructions to Bidders (hereinafter "the ITB"),
- (c) has not accepted the correction of mathematical errors in accordance with the ITB, or
- (d) has breached a provision of the Code of Integrity specified in the TB;

This guarantee will expire: (a) if the Bidder is the successful Bidder, upon our receipt of copies of the contract signed by the Bidder and the performance security issued to you upon the instruction of the Bidder; and (b) if the Bidder is not the successful Bidder, upon the earlier of (i) our receipt of a copy of your notification to the Bidder of the name of the successful Bidder; or (ii) thirty days after the expiration of the validity of the Bidder's bid.

Consequently, any demand for payment under this guarantee must be received by us at the office on or before that date.

Signed: _____

[Insert signature of person whose name and capacity are shown]

NOTE: * - Scheduled Bank Only

Name: _____

[insert complete name of person signing the Earnest Money]

In the capacity of: _____

[insert legal capacity of person signing the Earnest Money]

Duly authorized to sign the Earnest Money for and on behalf of _____

[insert name of the Bank]

Dated on day of ,

[insert date of signing]

Bank's Seal _____

[affix seal of the Bank]

[Note: In case of a Joint Venture, the Earnest Money must be in the name of all partners to the Joint Venture/Lead bidder that submits the bid.]

4.3.2 Bid Securing Declaration

Form of Bid Securing Declaration

Date: *[insert date (as day, month and year)]*

Bid No.: *[insert number of bidding process]*

Alternative No, if permitted: *[insert identification No if this is a Bid for an alternative]*

To: [CEO, KOTA SMART CITY LIMITEDKOTA]

We, the undersigned, declare that:

We understand that, according to your conditions, bids must be supported by a Bid-Securing Declaration.

We accept that we will automatically be suspended from being eligible for bidding in any contract with you, the Procuring Entity for the period of time of *[insert number of months or years, as required by the Procuring Entity]* starting on *[insert date]*, if we are in breach of our obligation(s) under the bid conditions, because we:

- (a) withdraw our Bid during the period of bid validity specified in the Letter of Bid; or
- (b) do not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB"); or
- (c) having been notified of the acceptance of our Bid by you, the Procuring Entity, during the period of bid validity, (i) fail or refuse to sign the Contract, if required, or (ii) fail or refuse to furnish the Performance Security Declaration, in accordance with the ITB; or
- (d) breach any provisions of the Code of Integrity as specified in the ITB;

We understand this Bid-Securing Declaration shall expire if we are not the successful Bidder, upon the earlier of (i) our receipt of your notification to us of the name of the successful Bidder; or (ii) thirty days after the expiration of our Bid.

Signed: _____

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

Name: _____

[insert complete name of person signing the Bid-Securing Declaration]

In the capacity of: _____

[insert legal capacity of person signing the Bid-Securing Declaration]

Duly authorized to sign the bid for and on behalf of: _____

[insert complete name of Bidder]

Dated on day of ,

[insert date of signing]

Corporate Seal _____

[affix corporate seal of the bidder]

[Note: In case of a Joint Venture, the Bid-Securing Declaration must be in the name of all partners to the Joint Venture/ Lead bidder that submits the bid.]

4.4.1 Bidder's Qualification

To establish its qualifications to perform the contract in accordance with Section III (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding Information Sheets included hereunder.

4.4.1(a) Form ELI - 1: Bidder's Information Sheet

BIDDER'S INFORMATION	
Bidder's legal name	
In case of JV/Consortium, legal name of each partner	
Bidder's /all JV/Consortium partners country of constitution.	
Bidder's /all JV/Consortium partners year of constitution	
Bidder's /all JV/Consortium partners legal address in country of constitution	
Bidder's /all JV/Consortium partners authorized representative (name, address, telephone numbers, fax numbers, e-mail address)	
Attached are self attested copies of the following original documents: <ol style="list-style-type: none">1. In case of single entity, certificate of registration/ incorporation and memorandum of association or constitution of the legal entity named above.2. Authorization to represent the firm or JV named in above.3. In case of JV, letter of intent to form JV or JV agreement.4. In case of Consortium, letter of intent to form consortium or JV consortium.	

4.4.2 Form ELI – 2: JV Information Sheet

Attach the Letter of Intent to form JV or certificate of registration/ incorporation and memorandum of association or constitution of the legal entity, if JV is already in existence.

Each member of a JV / must fill in this form

JV /consortium/ SPECIALIST CONTRACTOR'S INFORMATION	
Bidder's legal name	
JV /consortium Partner's or Subcontractor's legal name	
JV /consortium Partner's financial share in the JV	
JV /consortium Partner's or Subcontractor's country of constitution	
JV /consortium Partner's or Subcontractor's year of constitution	
JV /consortium Partner's or Subcontractor's legal address in country of constitution	
JV /consortium Partner's or Subcontractor's authorized representative information(name, address, telephone numbers, fax numbers, e-mail address)	
Attached are attested copies of the following original documents: <ol style="list-style-type: none">1. Certificate of registration/ incorporation and memorandum of association or constitution of the legal entity named above.2. Authorization to represent the firm named above.	

4.4.3 Form LIT 1- Pending Litigation

Each Bidder or member of a JV / must fill in this form

Pending Litigation			
<ul style="list-style-type: none">○ No pending litigation in accordance with Section III (Evaluation and Qualification Criteria).○ Pending litigation in accordance with Section III (Evaluation and Qualification Criteria)			
Year	Matter in Dispute	Value of Pending Claim in INR	Value of Pending Claim as a Percentage of Net Worth

4.4.4 Form EXP – 1: General Construction Experience

Each Bidder or member of a JV must fill in this form

GENERAL CONSTRUCTION EXPERIENCE				
Starting Month Year	Ending Month Year	Years	Contract Identification and Name Name and Address of Procuring Entity Brief Description of the Works Executed by the Bidder	Role of Bidder

Bidder Must Enclose:

1. Certificate of CA mentioning the construction turnover as per relevant clause.

4.4.5 Form EXP - 2: Construction Experience in Key Activities

Fill up one (1) form per contract

Contract with Similar Key Activities			
Contract No. of		Contract Identification	
Award Date		Completion Date	
Total Contract Amount		-----Equivalent INR ----	
If partner in a JV or subcontractor, specify participation of total contract amount		Percent of Total	Amount
Employer's Name Address Telephone Number Fax Number E-mail			
Description of the key activities in accordance with Criteria.			
Experience of Minimum Quantity as below:- i. Civil Works :- a) RCC work (M-20 & above) :- 3000m ³ b) Road Work :- 13250 m ² c) Cladding work :-2950m ² d) Flooring :- 27500 m ² ii. Electrical Work :- a) 11 KV SUB STATION:- 01Nos. iii. HORTICULTURE WORK :- a) Laying of LAWNS:-7950 M ²			
Reference page No., copy of work order (in case of PSU agreement/work order) and completion certificate in support of above experience:			

4.4.6 Form EXP – 2(a): Specific Construction Experience

Note: Please fill up one sheet per contract

CONTRACT OF SIMILAR SIZE AND NATURE		
Contract No.of.	Contract Identification	
Award Date		Completion Date
Role in Contract	Contractor / Management Contractor / Subcontractor	
Total Contract Amount	INR	
If partner in a JV or subcontractor, specify participation of total contract amount	Percent of Total	Amount
Procuring Entity's Name, Address, Telephone Number, Fax Number, E-mail address		

Bidder Must Enclose:

1. Work order (In case of PSU agreement/work order)
2. Experience certificate as per relevant clause from an officer not below the rank of executive Engineer or Equivalent.

4.4.7 Form : Format for Assured Revolving Line of Credit Facility

(To be submitted by a Scheduled Bank on the Bank's Letter head)

Date: *(Insert Date)*

To: CEO,
KOTA SMART CITY LIMITEDKOTA

Subject: Letter of Assurance for Revolving line of credit facility for INR ----

Dear Sir,

WHEREAS _____ [*name and address of Bidder*] (**hereinafter called the "Bidder"**) intends to submit a bid for----- ---(*name of contract package*) -----" under the CEO, KOTA SMART CITY LIMITEDKOTA (**hereinafter called the "Employer's representative"**) in response to the Invitation for Bids issued by the Nagar Nigam through NIB no. -----; and

WHEREAS the Bidder has requested that an assured revolving line of credit be provided to it for executing the ----- ---(*name of contract package*) -----In the event that the Contract is awarded to it; then

KNOW ALL THESE PEOPLE by these presents that We _____ [*name of Bank*] of _____ [*name of Country*] having our registered office at _____ [*address of registered office*] are willing to provide to _____ (the Bidder) a sum of up to _____ [*amount of guarantee in figures and words*] as an assured revolving line of credit for executing the Works under ----- ---(*name of contract package*) -----should the Bidder be awarded the contract based on its tendered prices.

We understand that this assurance may be taken into consideration by the Employer during evaluation of the Bidder's financial capabilities, and further assure that we intend to maintain this revolving line of credit until such time as the Works are completed and taken over by the Employer.

SEALED with the Common Seal of the said Bank on the ____ day of _____, 2016.

Date: _____ Signature of the Bank: _____

Witness: _____ Seal: _____

[Signature, name and address]

4.5 Declaration by the Bidder in compliance of Section 7 & 11 of the Act

Declaration by the Bidder/ JV

In relation to our Bid submitted to [enter designation and address of the procuring entity/ "the representative"] for procurement of [insert name of the Works] in response to their Notice Inviting Bids No..... Dated we hereby declare under Section 7 and 11 of the Rajasthan Transparency in Public Procurement Act, 2012, that;

1. We possess the necessary professional, technical, financial and managerial resources and competence required by the Bidding Document issued by the Procuring Entity;
2. We have fulfilled our obligation to pay such of the taxes payable to the Central Government or the State Government or any local authority, as specified in the Bidding Document;
3. We are not insolvent, in receivership, bankrupt or being wound up, not have my/our affairs administered by a court or a judicial officer, not have my/our business activities suspended and are not the subject of legal proceedings for any of the foregoing reasons;
4. We do not have, and our directors and officers not have, been convicted of any criminal offence related to our professional conduct or the making of false statements or misrepresentations as to our qualifications to enter into a procurement contract within a period of three years preceding the commencement of this procurement process, or not have been otherwise disqualified pursuant to debarment proceedings;
5. We do not have a conflict of interest as specified in the Rajasthan Transparency in Public Procurement Act, the Rajasthan Transparency in Public Procurement Rules and this Bidding Document, which materially affects fair competition;
6. We have complied and shall continue to comply with the Code of Integrity as specified in the Rajasthan Transparency in Public Procurement Act, the Rajasthan Transparency in Public Procurement Rules and this Bidding Document, till completion of all our obligations under the Contract.

Date: Signature of Bidder

Place: Name:

Designation:

Address:

4.6 Letter of Financial Bid

Financial Bid Submission Sheet

Date: _____

NIB No.: _____

To: _____

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Document, including Addenda No.: _____

(b) We offer to execute in conformity with the Bidding Document the following Works:

(c) The total Price for our Bid, excluding any discounts offered, if permitted, in item (d) below is: _____

(d) The discounts offered, if permitted, and the methodologies for their application are:

(e) We understand that this Bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal Contract is prepared and executed.

(f) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.

(g) Other comments, if any:

Name/ address: _____

In the capacity of: _____

Signed: _____

Duly authorised to sign the Bid for and on behalf of: _____

Date: _____

Tel: _____ Fax: _____

E-mail: _____

4.7. POWER OF ATTORNEY

Power of Attorney for Authorized Representative

The firm M/s.....authorize the following Representative to sign and submit the tender document, negotiate terms and conditions for the contract, to sign the contract, to deal with the _____, to issue and receive correspondence related to all matters of the tender "-----". We / M/s _____ undertake the responsibility due to any act of the representative appointed hear by.

For Partnership Firm's

S. No.	Name of the All Partner	Signature of Partner with Seal
1.		
2.		
3		
4	Name and Designation of the person Authorized	
5	Attested Signature of the Authorized Representative	

For Limited Firm's

Name and Designation of the person Authorized	
Firm	
Address	
Telephone No.	
Fax No.	
Telex No.	
Authority By which the Powers is delegated	
Attested Signature of the Authorized Representative	
Name and Designation of person attesting the signatures	

4.9: Joint Venture Agreement (Between not more than two firms)

(On Rs 1000/- Non-judicial Stamp Paper)

Memorandum of Understanding for
JOINT VENTURE

This Memorandum of Understanding (hereinafter referred to as "MOU") is made and entered into this ----- ("Effective Date").

BETWEEN

M/s. _____, a company incorporated, and having its registered office at _____.
(Hereinafter referred to as the "**First Party**"/ "**Lead Partner**");

M/s. _____, a company incorporated, and having Registered office at _____.
(Hereinafter referred to as the "**Second Party**"/ "**Second Partner**");
Hereinafter jointly referred to as the "**Parties**" and individually as "**Each Party**" or "**a Party**" as the case may be.

WHEREAS,

A) **The Government of Rajasthan, CEO, KOTA SMART CITY LIMITED KOTA, Rajasthan (hereinafter referred to as the CEO, KOTA SMART CITY LIMITED KOTA or "the representative") invited bid for**

(B) The **Parties** hereto formed a Joint Venture or will form a joint venture (hereinafter referred to as the "**JV**") to jointly execute the above project in all respect
NOW THEREFORE IT IS HEREBY AGREED as follows

ARTICLE 1: JOINT VENTURE:

- 1.1. The Parties hereto agree to form the Joint Venture with _____ designated as the **Lead Partner or First Partner**.
1.2. _____ shall be the **Second Member – or Second Partner**

ARTICLE 2: JOINT VENTURE NAME:

2. The JV shall do business in the name of "**_____ Joint Venture**".

ARTICLE 3: JOINT AND SEVERAL LIABILITY:

3. The **Parties** hereto shall, for the above-referred **Projects**, be jointly and severally liable to the **Employer** for the execution of the Projects in accordance with the **Contract** till the actual completion of Contract including defect liability period and operation & maintenance as per bid conditions.

ARTICLE 4: PROPORTIONATE SHARE:

4.1 Each member of the Joint Venture agrees to place at the disposal of the Joint Venture, the benefit of all its experience, technical knowledge and skill, and shall in all respects bear its share of responsibility and

burden of completing the contract. The parties herein shall be responsible for physical and financial distribution of work as under.

Lead Partner : Financial responsibility: -----
Physical responsibility: -----
Second Partner : Financial responsibility: -----
Physical responsibility: -----

4.2 All rights, interests, liabilities, obligations, risks, costs, expenses and pecuniary obligations and all net profits or net losses arising out of the **Contract** shall be shared or borne by the **Parties** in the above **Proportions**.

4.3 The members in the proportion as mention in article 4.1, shall contribute sufficient Initial fixed capital for timely execution of the project including commissioning & operating period as per the contract.

ARTICLE 5: JOINT EFFORT AND MANAGEMENT:

5.1 The **Parties** shall participate as a **JV** in the submission of bids and further negotiations with the **Employer** and shall co-operate and contribute their respective expertise and resources to secure and execute the **Projects**.

5.2 On award of **Projects**, the **First Partner** in consultation with the other members of JV will decide on the final management structure for the successful execution of the **Projects** as per the terms of **Contract**.

5.3 All the **Parties** hereby agree to pool in their financial, administrative, managerial, technical and material resources for execution of the **Projects**, including commissioning & operation for the period as stipulated in the contract. The share of interest of the **JV** shall be as per the mutual understanding for the successful completion of the project.

ARTICLE 6: EXCLUSIVITY:

6.1 The co-operation between the **Parties** hereto shall be mutually exclusive i.e. none of them shall without the other **Party's** consent & prior approval of **Nagar Nigam, Kota**, approach or cooperate with any other parties in respect of the Project.

6.2 In the course of working as associates, the parties to the JV will be sharing information with each other which may be proprietary /confidential information /knowledge acquired by each other. It is hereby agreed that the parties will maintain complete secrecy regarding such information / knowledge and will not divulge to any party for any other purpose except for the success of the joint execution of the contract. All parties will also indemnify each other against any claim that may arise out of using information, which are being claimed proprietary.

ARTICLE 7: Memorandum of Understanding:

7.1 This **Memorandum of Understanding** shall be terminated:-

- a. if the **Parties** mutually confirm that the **JV's** bid proposal has not been finally accepted by **Employer** and all rights and obligations of the **Parties** under or in connection with this **Memorandum of Understanding** have ceased, or
- b. after successful completion of the project including commissioning & operation and defect liability period from the date of this **Memorandum of Understanding** unless extended for a further period on demand of **KOTA SMART CITY LIMITED** & mutual consent of the Parties, or

7.2 The **Memorandum of Understanding** can be modified by mutual consent of the Parties to suit the efficient and expeditious execution of Projects including commissioning & operation of Plant or to make this agreement more meaningful to suit the requirements of Employer **after the consent of the Employer**.

ARTICLE 8: ARBITRATION:

8.1 Any dispute resulting from this Agreement shall be settled amicably by mutual Consultation by the Managing Directors/Chairman of _____ & _____. In the event that an amicable settlement is not reached within 60 days in any particular case, the dispute shall be referred to arbitration and shall be resolved in accordance with and subject to the provisions of the _____ and any statutory modifications and enactment hereof for the time being in force. The decision of the arbitrators shall be final and binding upon both parties. The venue of arbitration will be _____.

ARTICLE 9: GOVERNING LAWS:

9.1 This Agreement shall in all respects be governed by and interpreted in accordance with the _____ Laws.

ARTICLE 10: CONFIDENTIALITY:

10.1 No Party hereto shall disclose to any other party any information of a confidential nature including but not limited to trade secrets, know-how acquired from any Party in connection with the subject matter of this Agreement.

ARTICLE 11: ADDRESS OF CONSORTIUM:

Any and all correspondence from the Employer to the **JV** shall be addressed to **(name of JV)** at the address stated herein below—(any one of the partners). The address of the Consortium office of the partner companies will be deemed to be the address for the purpose of communication.

The notice, if any required to be served on the party by the other party, will be deemed to be served, if the said notice / communication is delivered by Registered Post at the respective address **(name of JV)**

ARTICLE 12: Authorized Representative:

The JV shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the JV during the bidding process and, in the event the JV is awarded the Contract, during contract execution.

Authorized Representative of JV: _____

ARTICLE 13: ASSIGN ABILITY:

13.1 The interests and rights of a Party in the Contract and as a Party of the Joint Venture shall not be transferable or assignable without the written consent of the Employer & other party.

ARTICLE 14: INTERPRETATION OF HEADINGS:

14. The headings of each of the Articles herein contained are inserted merely for convenience of reference and shall be ignored in the interpretation and construction of any of the provisions herein contained.

ARTICLE 15: OTHERS

15.1 Any other matters not contained in this Agreement shall be discussed and amicably agreed upon by the Parties in the spirit of mutual trust and cooperation for timely completion of project including commissioning & operation of project. Notwithstanding anything above all the Parties are severally and jointly responsible to the Employer for execution of the Contract:

IN WITNESS WHEREOF the Parties hereto have caused this Agreement to be executed by each of the duly authorized representatives as appearing below:-

Signed by)
For and on behalf of)

_____)

in the presence of:)

_____)
Name:)

Designation:)

Signed by)

For and on behalf of)

_____)

in the presence of:)

_____)
Name:)

Designation:)

Name:

Designation:

Name :

Designation:

4.10 Bidding Capacity = 2 A X N - B

4.10.1 STATEMENT FOR WORK IN HAND (for calculation of value of B)

This is to certify that the status of the present works in hand as on **date of publication of NIT** of order value more than Rs. 10.00 lacs for which either order are received or the work is under execution but which are still not completed is as under:

Amount in Lacs of Rupees.

S. No	Brief Description of Work	Stipulated Date of Start	Stipulated Date of Completion	Time left for execution after date of publication of NIT , in months	Cost of awarded work	Cost of work executed up to date of publication of NIT	Balance Cost of un-executed work as on date of publication of NIT in 30 month from and date of submission
1	2	3	4	5	6	7	8=6-7

1. If the value of Balance work goes beyond 30 months from the date of bid submission then client certificate mentioning the amount of work to be executed beyond 30 months, otherwise full balance work shall be accounted for calculation of 'B' value.

2. This is certified that this is true in all respect and can be used for calculation of the bidding capacity as per the formula given in ITB. This is also certified that other orders under execution by the firm shall not materially affect the bidding capacity of the firm as required in this tender. (**Format should be on Rs 500/= stamp paper**)

Signatures With Seal of Authorized Signatory for tender

Check Points must be filled by Bidder

S.No.	Paper no. RFP	Requirements / Documents required to be submitted	Check Points	YES/NO	Enclosed at page no. of bid and any other detail as required
1		Cost of Bid Document as Rs.20,000/-	DD/Cheque in favour of CEO, KOTA SMART CITY LIMITEDKOTA Original hard copy to be submitted in the office of CEO, KOTA SMART CITY LIMITEDKOTA by date and time mentioned in NIB and scanned		
				Confirm it is of scheduled bank? Name of Bank Amount Rs.20000.00 In favour of CEO, KOTA SMART CITY LIMITEDKOTA	
2		Bid Processing Fee of Rs 1,000/-	DD/Cheque in favour of MD, RISL bid Original hard copy to be submitted in the office of CEO, KOTA SMART CITY LIMITEDKOTA by date and time mentioned in NIB and scanned copy to be uploaded with technical	Confirm it is of scheduled Bank? Name of Bank	
				Amount Rs. 1000.00	
				In favour of MD, RISL	
3		Earnest Money of Rs. Rs. 1,28,54000/- (One Crore twenty eight lac fifty four thousand only) In case of JV, the Bid Security must be in the	DD Guarantee as per format on page Original hard copy to be submitted in the office of CEO, KOTA SMART CITY LIMITEDKOTA by date and time	Confirm that as per Format? Confirm that it is in prescribed format? If not, Liable to be rejected. Confirm that it is	

S.No.	Paper no. RFP	Requirements / Documents required to be submitted		Check Points	YES/NO	Enclosed at page no. of bid and any other detail as required
		name of all partners to their Joint Venture / Lead bidder that submits the bid. Should be valid up to		unconditional? If any condition bid liable to be rejected.		
			copy to be uploaded with technical bid	State in whose name is bid security (JV or Lead Bidder)		
				BG number		
				Confirm that BG is Valid up to 30 days beyond the validity of bid		
				Confirm it of a scheduled bank? Mention the Name of bank.		
				Amount		
4		Power of Attorney	On Stamp Paper, as per page Original hard copy to be submitted in the office of CEO, KOTA SMART CITY LIMITEDKOTA by date and time mentioned in NIB and scanned copy to be uploaded	Confirm that value of Stamp Paper is Rs. 500/-		
				Name & designation of person who has issued POA		
				Name & designation of person to whom POA is issued		

S.No.	Paper no. RFP	Requirements / Documents required to be submitted	Check Points	YES/NO	Enclosed at page no. of bid and any other detail as required
			with technical bid		
5		Joint Venture Agreement	Agreement as per format on page (not more than two companies)Original hard copy to be submitted in the office of CEO, KOTA SMART CITY LIMITEDKOTA by date and time mentioned in NIB and scanned copy to be uploaded with technical bid	<p>Confirm that value of Stamp Paper is Rs.1000/-</p> <p>Confirm that financial responsibility of lead partner is minimum 51%</p> <p>Confirm that financial responsibility of other partner bidder is minimum 25%</p>	
				Confirm that JV is in prescribed format. If not, liable to be rejected.	

4.12 SELF APPRAISAL SHEET TO BE FILLED BY THE BIDDER FOR DETERMINATION OF RESPONSIVENESS

S.No.	Paper no. RFP	Requirements as per bid document	Check Points	Tick the correct option or fill in information	Enclosed at page no. of bid and any other detail as required
General Requirements					
1	33	The Bidder / both of the partners of JV must be registered Contractor in AA class of the department / organization of any State Govt./ Central Govt. / PSU / Govt Autonomous Body / Govt. Undertaking of country. He shall furnish necessary proof for the same.PSU (Indian) can participate in tender without registration.	Confirm that bidder / both partners of JV are registered in class A & AA or equivalent	YES/NO	
			Name of department & State		
			Confirm that valid up to date of submission of bid	YES/NO	
2		VAT Registration /clearance certificate	Confirm that submitted	YES/NO	
3		VAT Registration in Rajasthan	Confirm that submitted with this bid or will be submitted later as per clause	Yes / later after award	
Eligibility Criteria					
4	40	Nationality - Indian/International firms	Specify nationality	Indian/Inter National	

S.No.	Paper no. RFP	Requirements as per bid document	Check Points	Tick the correct option or fill in information	Enclosed at page no. of bid and any other detail as required
5	40,65	Declaration as per format on page 65 Requirement to be fulfilled by: Each of the consortium / JV member	Confirm that declaration submitted by bidder / each partner in case of JV	Yes / No	
			Confirm that it is in the prescribed format. If not, bid is liable to be rejected	Yes / No	
6	40	declaration regarding Debarment/Transgression by any procuring entity Requirement to be fulfilled by: Each of the consortium / JV member	Confirm that declaration submitted by bidder / each partner in case of JV	Yes / No	
			Confirm that it is in the prescribed format; If not, bid is liable to be rejected	Yes / No	
7		Pending Litigation in Form LIT-1 - All pending litigation shall be treated as resolved against the bidder and so shall in total not represent more than 50 percent of Bidder's net worth Requirement to be fulfilled by: Each of the consortium / JV member	Confirm that declaration submitted by bidder / each partner in case of JV	YES/NO	
			Confirm that it is in the prescribed format; If not, bid is liable to be rejected		
			Confirm that value of litigations is less than 50%of bidder's net worth and CA certificate showing calculation	YES/NO	

S.No.	Paper no. RFP	Requirements as per bid document	Check Points	Tick the correct option or fill in information	Enclosed at page no. of bid and any other detail as required
8		Experience of construction contracts in the role of contractor for at least last 5 Years prior to the Bid submission deadline.	Confirm that Certificate of CA attached; If not, bid is liable to be rejected	YES/NO	
9		<p>Should have completed Building/ Public Utility/Horticultural/Infrastructure development / Airport work / but excluding Road and Surface Parking work in all above categories with following sub criteria</p> <p>(c) Two Building / Public Utility / Horticultural / Infrastructure development/Airport work / but excluding Road and Surface Parking work in all above categories completed work costing not less than the amount equal to 25 % of the estimated cost. Or</p> <p>(d) One Building / Public Utility / Horticultural / Infrastructure development/Airport work / but excluding Road and Surface Parking work in all above categories completed work costing not less than the amount equal to 50% of the estimated cost.</p> <p>Experience of Minimum Quantity as below:-</p> <p>i. Civil Works :-</p> <p>a) RCC work (M-20 & above) :-3000m³</p> <p>b) Road Work :- 13250 m²</p> <p>c) Cladding work :-2950m²</p> <p>d) Flooring :- 27500 m²</p> <p>ii. Electrical Work :-</p> <p>a) 11 KV SUB STATION:-01Nos.</p> <p>iii. HORTICULTURE</p>	<p>Number of works on basis of which eligibility is claimed.</p> <p>Approved Quantity Certificate of the work; if not, the bid is liable to be rejected</p>		

S.No.	Paper no. RFP	Requirements as per bid document	Check Points	Tick the correct option or fill in information	Enclosed at page no. of bid and any other detail as required
		<p><u>WORK :-</u> a) Laying of LAWNS:-7950 M²</p>			
10		<p>i) Copies of Work Orders, Completion and satisfactory performance Certificates in support of their experience claims. Only works of Govt/Urban Local bodies under Govt. Sector shall be considered. The works which have been completed during the period mentioned above, though may have commenced earlier, and shall be considered for experience purposes.</p>	<p>Name of client</p> <hr/> <p>Value of work done</p> <hr/> <p>value of work done by bidder in case work is carried out in JV</p> <hr/> <p>Stipulated Date of start (as per work order)</p> <hr/> <p>Stipulated Date of completion (as per work order)</p> <hr/> <p>If completed & commissioned, indicate Actual date of completion commissioning (as per client's certificate). Confirm that this date is after</p> <hr/> <p>Confirm any one of the following:</p> <p>i. Work is completed and</p>		

S.No.	Paper no. RFP	Requirements as per bid document	Check Points	Tick the correct option or fill in information	Enclosed at page no. of bid and any other detail as required
			commissioned ii. works is completed but could not be commissioned because of hindrances beyond control of contractor iii. Work is completed and commissioned		
11		At least of the amount For considering experience of the bidder, out of its experience as required for qualification, out JV, its own works in the JV shall be considered with relevant of large size contract. Evidence /certificates.	Confirm that client's certificate clearly mentions one of the above 3 criterion, with details, otherwise bid is liable to be rejected. Confirm that copy of work order is attached. Confirm that copy of client's certificate is attached and it has reference of above work order. Confirm that the certificate is issued by the officer not below the rank of Executive Engineer		

S.No.	Paper no. RFP	Requirements as per bid document	Check Points	Tick the correct option or fill in information	Enclosed at page no. of bid and any other detail as required
			Confirm that the certificate is issued by the officer not below the rank of Executive Engineer.		
			Similar information to be given for each work if work done is more than one		
12		If Contractor has completed the work at least of the amount Required for qualification, out of large size contract. In case of JV, all partners combined should meet the requirement	Details of qualifying works :Work no. 1		
			Name of work (in brief)		
			Name of client		
			Value of work done		
			value of work done by bidder in case he carried out this work as JV		
			Stipulated Date of start (as per work order)		
			Stipulated Date of completion (as per work order)		
13			Confirm one of the following:		

S.No.	Paper no. RFP	Requirements as per bid document	Check Points	Tick the correct option or fill in information	Enclosed at page no. of bid and any other detail as required
			<p>i. Work is completed and commissioned</p> <p>ii. works is completed but could not be commissioned because of hindrances beyond control of contractor</p> <p>iii. Work is completed and commissioned at least of the amount required for qualification, out of large size contract.</p> <p>Confirm that client's certificate clearly mentions one of the above 3 criterion, with details.</p> <p>Confirm that copy of work order is attached.</p> <p>Confirm that copy of client's certificate is attached and it has reference of above work order.</p> <p>Confirm that the certificate is issued by the officer not below the rank of Executive</p>		

S.No.	Paper no. RFP	Requirements as per bid document	Check Points	Tick the correct option or fill in information	Enclosed at page no. of bid and any other detail as required
			Engineer.		
14	43	Net Worth of the bidder as on last date of previous financial year (of which audited balance sheet is available) shall not be less than = 10% of Estimated bid cost (Certificate of Chartered Accountant showing calculation of Net Worth must be enclosed).	Confirm that Certificate of Chartered Accountant attached with calculation of net worth; If not, bid is liable to be rejected		
15	58	Average Annual construction Turnover of any three years out of last Four years (Financial Year 2013-14 to 2016-17 current year) should be equal to or more than (1.5 x cost of work / time period in years) Audited Balance Sheets of all the three financial years must be submitted in support, without which the bid may not be considered. The calculation sheet for annual average construction turnover shall be certified by a Chartered Accountant.	Confirm that Certificate of Chartered Accountant clearly mentioning word "construction" turnover and its value for each financial year and calculation of average value at present price level, attached; If not, bid is liable to be rejected Indicate value of avg. annual turnover		
16	42	Bid capacity = 2 A X N - B	Confirm that affidavit of bid capacity submitted on Stamp Paper of Rs.500.00 Confirm that certificate of CA submitted for Bid Capacity clearly showing calculation; If not, bid is		

S.No.	Paper no. RFP	Requirements as per bid document	Check Points	Tick the correct option or fill in information	Enclosed at page no. of bid and any other detail as required
			liable to be rejected		
			Value of A		
			Value of B		
			Bid Capacity		
			Confirm that bidder has mentioned in affidavit that all works above Rs. 10lac., to be completed in next 30 months (period of completion + bid validity period), required for determination of value fob” are declared		
22	42	Working capital	<p>Confirm that certificate of CA submitted indicates clearly that the working capital is as per formula</p> <p>Given in tender. Confirm that CA has clearly mentioned that he has gone through the letter of Revolving Line of Credit and bank’s (scheduled Bank) commitment letter is</p>		

S.No.	Paper no. RFP	Requirements as per bid document	Check Points	Tick the correct option or fill in information	Enclosed at page no. of bid and any other detail as required
			project specific and assured without any ambiguity otherwise bid is liable to be rejected.		
			Confirm that bank's letter submitted for revolving line of credit, If required		
			Confirm that the above bank's letter is as per format;		
			Value of working capital		

SECTION V-
**PROCURING ENTITY'S REQUIREMENT/
SCHEDULE OF TECHNICAL
SPECIFICATIONS**

SECTION V-PROCURING ENTITY'S REQUIREMENT/ **SCHEDULE OF TECHNICAL SPECIFICATIONS**

REQUIREMENT OF WORKS

The components of the work include but not limited to:

- i) DussehraMaidan comprising of
 - a. Rangmanch comprising of RCC Structure Stage with Roof Slabs and associated service areas.
 - b. Open Air Sitouts
 - c. Ravan Dahan Stage and adjoining areas
 - d. Gates adjoining the Rangmanch area
 - e. Boundary Walls.
- ii) External Boundary Walls comprising of RCC, Brickwork, Cast Iron Railings, Stone Cladding and related Civil Works.
- iii) Main Gates
- iv) Toilet Blocks
- v) Underground Rain Harvesting Water Tanks.
- vi) Temporary and Permanent shops.
- vii) Chowpal
- viii) Chowkies
- ix) Bus Stops
- x) Road Works and Paving
- xi) Plumbing Works
- xii) Electrical Works
- xiii) Demolition of Existing Structures.
- xiv) Surveying and Soil Investigation
- xv) Horticulture
- xvi) Heritage Items

Brief Notes on Elements of the Project:

1. Civil Works/ General

- i. Re-organizing DussehraMaidan mechanism through new networks of paths and roads to provide better and easy operations.
- ii. Introducing neo-social elements like E-Chowpal extracted from vernacular Kota and framed in contemporary systems of technology.

- iii. Rebuilding Shri Ram Rangmanch corresponding to traditional elements of Kota architecture and better efficiency catering to more viewers and functions through flexibility.
- iv. Composing the shop layout with an addition into the total number of shops to cater to future needs and preventing hazards and chaos.
- v. Promoting traditional Kota by implementing the local character and material in modern and contemporary way exhibiting the use of traditional Kota and Jaisamer stone on to contemporary architecture.
- vi. Introducing the features like rainwater harvesting by corresponding to natural contour features and providing the required infrastructure.
- vii. Rigidifying the coherent system of mela security and other amenities by spreading the checkpoints and help desks throughout the campus built in transparent natured structures not being a visual hindrance.
- viii. Introduction of navigational elements through axis and landmarks adding to architectural character of the place and leading to better and organized movement strategies.
- ix. Providing a strong network of public utilities like public toilets, water stations and help desks induced into mela at strategic and well planned locations.
- x. Planning and designing of the structures so as to merge in a coherent and local language through corresponding architecture and vernacular material like Kota stone and Jaisalmer stone.
- xi. Strategizing the main entrances and emergency gateways so as to avert any disaster and mishaps and promote a better sense of security and regulations.
- xii. Providing a better and safe parking premise strategically located on peripheries and at locations to avert traffic jams and unsafe environment.
- xiii. Identifying the networks of pedestrian and vehicular roads along with designated VIP movements for a better and non- overlapping situation.
- xiv. Providing a coherent social infrastructure in form of public furniture, better signage system, dustbins and bollards.
- xv. Placing the prominent traditional element-Chhatris into built forms and important landmarks to as to maintain that character.
- xvi. Designating a well designed, semi transparent compound wall to curb the problem of encroachment onto the site, keep unwanted occupancies away and yet provide the character to the place.

2. Infrastructure

- i. The phase 1 development of Kota Dussehramaidan also has site infrastructure elements like the street furniture that compliments the proposed architecture and local elements and variety of signage's that blend and help navigate the local public entering the site. These facilities are been planned as the existing site is devoid of such facilities.

- ii. The street furniture comprises of elements like stone bollards that are planned along the main central avenue using kota stone.
- iii. Dust bins are also planned at various spots all along the entire site using local elements like jaali in the design using kota stone.
- iv. For visitors and the general public visiting the maidan, provision of seating facilities like benches have been proposed using local elements and kota stone.
- v. Proposal for a bus stop has been facilitated using local design and modern elements like steel and complimented with local stone like kota with ammenties like backlit panel for advertising and bus routes.
- vi. Signage's include various signage's like signage 1 - is a 6 meter tall directional signage placed at strategic locations so that they are visible from far distances and using concrete and kota stone with cut letters.
- vii. Signage 2 is again a 3 meter high directional signage that will help the people navigate through the various proposed spots like toilets etc.
- viii. Signage 3 is again signage's identifying individual elements like toilets, food court, rang manch etc. Using kota stone slabs.
- ix. Individual information signage's are also designed at proposed at various spots that has the entire proposed map and location spots using kota stone.
- x. Various signage design's include cut letters of various sizes using brass and stainless steel to compliment the proposed design.
- xi. Also modern materials like acrylic cut signages for toilets and exit / entry points.

3. Electrical

- i. Proposed 3 nos substations with total installed capacity of 3000 kva.
- ii. Entire phase 1 is divided in 3 nos zone and each zone proposed with 2 nos – 500 kva transformer with main LT panels.
- iii. H.T 2 nos cables for each substation – 1 working + 1 stand by.
- iv. L.T ring/ change over system between all main L.T panels so that supply can be restored with minimum down time.
- v. Dedicated DG set for fire fighting system and dedicated DG set for shree ram rang manch.
- vi. DG back up for entire street lighting system including high mast in entire phase 1 plot. Hence at any given point of time there will not be any darkness.
- vii. Solar based lighting system with storage battery back up and same will be connected to electrical distribution system as additional back up or as alternate source.
- viii. Proposed fire detection and alarm system for enclosed areas for fire saftety.
 - a. Entire metering will be HT metering from jvnnl and sub panels will be designed in such way that jvnnl can installed their LT meters as per the shop configuration

4. Plumbing

- i. Potable water available from Nagar Nigam water department. This water is further treated in centralized RO system, which is pumped to overhead tanks for supply to drinking water fountains at various points and food stalls.
- ii. Borewell water is used for toilets flushing and gardening.
- iii. Rain water harvesting tank is provided. This water will be used for landscape purpose; through overhead tanks at various points.
- iv. Drainage from food courts will pass through grease traps and then the water is connected to septic tank. Septic tank effluent from 3 points will be collected in a tank with pumping station. This effluent from septic tank will be pumped to STP across nallah.
- v. All storm water drains are connected to rain water harvesting tank through sand filter.
- vi. All pumps are connected to 3 to 4 overhead tanks simultaneously through level controllers, solenoid valves, motorized control valves and panel accordingly.
- vii. Best CP fittings and sanitary wares are selected to maintain high standards.

5. Horticulture

- i. The entire horticulture works proposed for phase 1 is divided into large vistas and medians with avenue trees, hedges, shrubs, lawns and other green areas that are local to the kota area and rajasthan state and will provide enough shade / resting points during all the social activities in the maidan.
- ii. Earth mounds with grass covering are also been planned along the rear of the toilet blocks that integrate with the overall landscape.
- iii. The central proposed median has been planned with avenue trees like *gulmohar* on either sides at every 5 meter c/c.
- iv. All entry points have been designed with raised kund's and chattri's that follow the local heritage architecture. These chattri's and kund's have trees like *champa* and shrubs like *bougenvilla* that compliment the proposed architecture.
- v. All the landmarks planned like chattri's / choupal's for phase 1 that define the meeting points or axis points are again proposed with shrubs like *bougenvilla* and miniature lawns.
- vi. Along the chambal road the proposed avenue trees are *amaltas* and *ailanthus excelsia* that are local to the state and kota area and continue upward.
- vii. The rang manch proposed shop areas are divided into medians and avenues and each median is complimented with *champa*, *lagistromia indica* trees that are planted on every seating area planned along the median.
- viii. The main roads that lead to the rang manch from the entry points have been planned with trees like *champa* and hedges and shrubs like *hibiscus* and *indian lavender* giving it a sense of depth and compliments the rang manch.

- ix. The proposed e - choupal located centrally and connecting the main entry points has been planned with beautiful shrubs and hedges like *bougenvilla*, *indian lavender* and *hibiscus*. The area around the choupal has green lawns and trees like *champa* and small trees like *bombax ceiba*.
- x. Greens areas have been planned around public areas like toilets and water cooler points and other landmarks like parking lots using lawns and grass pavers with local kota stone.

1.0 Objective of the Package

- 1.1 In order to achieve the above, measures like planning alternative routes for traffic, removing the excavated soil from site while work is progress and to store it in suitable location and bringing it back for refilling, proper barricading, lighting of the excavated sites during nights, repair of roads immediately after completion of the work in minimum time will have to be taken.
- 1.2 The methodology of execution of work shall be as per and specifications and direction of Engineer-in-charge (EIC).
- 1.10 Engineer In charge or his representative shall undertake joint site visit to ensure possession of all sites immediately after issuing Notice to Proceed (NTP).A "Handing over/Taking over of Sites Note shall be prepared after physical visiting the site detailing out any hindrances/encroachments, if any.
 - 1.11 In case of such hindrances/ encroachments, probable dates of removal of hindrance/encroachments shall be given by the Executive Engineer in this "Handing over/Taking over of Sites Note and such a Note shall be jointly signed by the Executive Engineer as well as the Contractor.
 - 1.12 The contractor shall establish and maintain 700 sq. ft. well-furnished office and well equipped 200 sq. ft Laboratory with min 5 tables, 15 chairs, 3 steel almirah, and two computers with printer, internet network, & operator, sufficient number of display etc. to the satisfaction of the Executive Engineer including Electrical, water& internet expenses etc.
 - 1.13 Care should be taken to visit all sites, if large no of work sites is included in the contract.
 - 1.14 The sites shall be jointly visited by the Executive Engineer and the contractor for this contract.
- 1.3 Conducting survey to verify the levels given in the tender document. If any difference in levels is found, the same shall be reported to the EIC immediately.
- 1.4 Planning and taking up the work according to the Methodology/work plan or as per a modified work plan duly agreed and approved by the Engineer in charge.
- 1.5 The excavated areas should be barricaded so as to prevent accidents.
- 1.6 Suitable shoring and shuttering designs will be got approved from the EIC for all excavations and the shoring and shuttering will be provided.
- 1.7 Arrangements for dewatering (well points or small pumps) of the soil as required will have to be maintained during the work.

- 1.8 The lines laid will be hydraulically tested from manhole to manhole as soon as laid. The contractor shall have to conduct hydro-testing of the sewer line laid and the manholes constructed immediately after laying / construction.
- 1.9 The contractor will be responsible for procuring the sewer pipes, man hole frames and covers and other materials as required as per specifications, to maintain their safe custody and for proper installations.
- 1.10 The roads or pathways damaged during construction have to be reinstated to at least original level after completion of the work in that section.
- 1.11 The levels of the manhole covers and the road repair should match the existing road surface and not affect the riding quality of the road.
- 1.12 The site should be cleaned of all the surplus material and broomed to leave a clean surface at the end of work.
- 1.13 The contractor will be fully responsible for structural safety stability and water tightness of the sewer line and associated work.
- 1.14 The O&M period of all the works under this package shall be 04 years in which the initial first year shall be the defect liability period. No payment for O&M shall be made in the Defect Liability period. The annual/yearly O&M charges shall be fixed and as specified in the BOQ/Tender Document. O&M charges include all expenditures and expenses required to be incurred on labour, repair of material, preventive and / or breakdown maintenance excluding cost of any new material. (The O&M charges do not include power charges which shall be paid by the department/line agency).
- 1.15 In general, the minimum machinery, equipment and manpower given in the Section VI B - Clause 22 & 23., shall be deployed by the contractor during the defect liability period as well as during the entire O&M period of 03 years so as to ensure efficient O&M ..

2.0 Other Services

- 2.1 **Work program:** The contractor may provide his alternative plan of work within 15 days of start for consideration of the EIC who may agree to a changed work program and the same shall be followed.

3.0 Testing

- 3.1 All the testing of sewer lines and other appurtenances, at both factory and site shall be carried out in presence of the Engineer-in-charge or his representative.
- 3.2 Steel, when arranged by the contractor shall produce a test certificate for the whole lot as per the IS Code provisions from an authorized laboratory approved by the Engineer-in-charge.
- 4.3 Taking Over/Completion certificate

The taking over/Completion certificate of the work as per the provision of clause 53 of section IV, special conditions of Contract, shall not be issued by the Engineer-in-charge in the event of the Contractors failures to furnish the aforesaid "As Constructed" drawings (completion drawing) as mentioned in clause 10.0 of this section for the entire works.

TENTATIVE WORK PLAN

S.NO.	FUNCTIONS	1st Month				2nd Month				3rd Month				4th Month				5th Month				6th Month				7th Month				8th Month				9th Month				10th Month			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Appointment Of Contractor																																								
2	Mobilisation Period																																								
3	Clearing Of Land & Testing																																								
4	Demolition Of Existing Blogs																																								
5	Removal Of Existing Services																																								
6	Construction Of Permanent Shops																																								
7	Construction Of Temporary Shops																																								
8	Construction Of Chaupal & Processional Pathway																																								
9	Construction Of Toilet, Water Fountains, U.G. Tanks																																								
10	Construction Of Shree Ram Rang Manch																																								
a	Ravan Dahan Stage With Rooms																																								
b	Rang Manch With Seating ,Toilets,Gateways Etc.																																								
11	Dussehera Maidan																																								
12	External Roads																																								
13	Internal Roads & Parking																																								
14	Boundary Walls																																								
a	External																																								
b	Internal																																								
15	Water Supply, Drainage, Plumbing & Fire Fighting																																								
a	External																																								
b	Internal																																								
16	Tube Well																																								
17	Electrical Works																																								
a	External, Sub Station, DG, etc.																																								
b	Internal																																								
18	Landscaping																																								
19	Street Furniture & Signage																																								
20	Handing Over Of Site																																								

PART – B
CIVIL & STRUCTURAL

PART B- CIVIL & STRUCTURAL

TECHNICAL SPECIFICATION FOR GENERAL CIVIL WORKS

1. GENERAL

- i. The detailed specifications given hereinafter are for the items of works described in the schedule of quantities attached herein & shall be guidance for proper execution of work to the required standards.
- ii. It may also be noted that the specification are of generalized nature & these shall be read in conjunction with the description of item in schedule of quantities & drawings. The work also includes all minor details of construction which are obviously & fairly intended & which may not have been referred to in these documents but are essential for the entire completion in accordance with standard Engineering practice.
- iii. Unless specifically otherwise mentioned, all the applicable codes & standards published by the Indian standard Institution & all other standards which may be published by them before the date of receipt of tenders, shall govern in all respects of workmanship quality & propitious of materials & methods of testing, method of measurements etc. Wherever any reference to any Indian Standard specifications occurs in the documents relating to this contract, the same shall be inclusive of all amendments issued to or revisions thereof, if any, up to the date of receipt of tenders.
- iv. In case there is no I.S.I specification for the particular work, such work shall be carried out in accordance with the instructions in all respects, & requirements of the Engineers-in-Charge. Wherever any reference to any Indian standard specification occurs in the documents relating to this contract, the same shall be inclusive of all amendment issued there to or revisions thereof, if any, up to the date of receipt of tenders.
- v. The work shall be carried out in a manner complying in all respects with the requirements of relevant bye-laws of the Municipal Committee/Municipal Corporation/Development Authority/Improvement Trust under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-Charge and, unless otherwise mentioned, nothing extra shall be paid on this account.
- vi. Samples of various materials, hardware, sections, stone tiles, finishes, fitting, Paints of various shades etc. proposed to be incorporated in the work shall be submitted by the contractor for approval of the Architect/Engineers-in-Charge before order for bulk supply is placed.
- vii. In addition to the above, Contractor should make samples of Work proposed to be executed out of the above, for approval of the Architect/ Engineer In Charge such as Executed Samples of Wall tiles, Stone Cladding, Floor Tiling and Paving, Compound Wall, Signage and Street Furniture. The items listed earlier are included but not limited to the list and items may get added / deleted in the list as per the requirement of the Work.
- viii. The contractor shall take instructions from the Engineer-in-Charge regarding collection and stacking of materials in any place. No excavated earth or building materials shall be stacked on areas where other buildings, roads, services, compound walls etc. are to be constructed.
- ix. The contractor shall maintain in perfect condition all works executed till the completion of the entire work allotted to him. Where phased delivery is contemplated, this provision shall apply to each Phase.
- x. The contractor shall give a performance test of the entire installation(s) as per standard specifications before the work is finally accepted & nothing extra whatsoever shall be payable to the contractor for the test.
- xi. The contractor shall clear the site thoroughly of all scaffolding materials & rubbish etc. left out of his work & dress the site around the building to the satisfactions & his decision in writing shall be final & binding on all concerned.
- xii. Post construction inspection and testing: After completion of the work and during maintenance period liability of the contractor, the work shall also be subjected to 'Post

construction inspection and testing'. In case the materials or articles incorporated in the work are found to be inferior, though the sample collected for the same might have been passed at the time of execution, it shall be the responsibility of the contractor to replace the same at his own cost, failing which the Department may rectify the same at the risk and cost of the contractor or Department may accept the work as substandard, and cost be adjusted from the outstanding security deposit, as per the terms and conditions of the contract for the work.

xii. The Procuring Authority, shall be the sole deciding authority as to the meaning, interpretations and implications for various provisions of the specifications and his decision in writing shall be final and binding on all concerned.

xiii. In case any different or discrepancy between the specification & the description in the schedule of quantities, the schedule of quantities shall take precedence. In case of any difference or discrepancy between specification & drawing, the specification shall take precedence.

1. LIST OF INDIAN STANDARDS:

Following are the various pertinent Indian Standards, relevant to buildings works :

(All Latest Versions of I.S. codes shall be referred)

A. CIVIL WORKS

1. CARRIAGE OF MATERIALS

4082-1996 Recommendations on stacking & storage of construction materials and components at site.

2. EARTH WORK

1200 Pt. I-1992

Method of measurement of Earth work.

4081-1986

Safety code for Blasting and related drilling operations.

6313 (Part 2) 2001

Anti Termite Measures in Buildings Part – 2 Pre-constructural chemical treatment.

3. MORTAR

196-1966

Atmospheric conditions for testing (Reaffirmed - 1990)

269-1989

33 Grade Ordinary, rapid hardening and low heat Portland cement

383-1970

Coarse and fine aggregates from natural sources for concrete.

455-1989

Portland blast furnace slag cement

650-1991

Standard sand for testing of cement

1489-1991

Portland pozzolana cement Fly ash based

1514-1990

Methods of sampling & Test for Quick Lime & Hydrated Lime. (Reaffirmed - 1996)

1542-1992

Sand for Plastering.

1727-1967

Methods of tests for pozzolanic materials

2250-1981

Code of practice for preparation and use of masonry mortar. (Reaffirm-1990)

2386-1963

Methods of Test for Aggregates for Concrete

2386 Pt.I-1963

Particle size and shape

2386 Pt. II-1963

Estimation of deleterious materials and organic impurities

2386 Pt.III-1 963

Specific gravity, density, voids, absorption and bulking

3025-1964

Methods of sampling & test (Physical & Chemical) water used in industry. (Reaffirmed-2003)

3068-1986	Broken brick (burnt clay) coarse aggregate for use in lime concrete (II-R.)
3182-1986	Broken brick (Burnt clay) fine aggregate for use in lime mortar
3812-1981	Fly Ash using as pozzolana and admixtures (Reaffirmed - 1999)
4031-1996	Methods of physical tests for hydraulic cement (Reaffirmed – 1996)
4032-1985.	Method of chemical analysis of hydraulic cement (Reaffirmed -1990)
4098-1983	Lime pozzolana mixture (Reaffirmed - 1989)

4 . CONCRETE WORK

383-1970	Coarse and fine aggregate from natural sources for concrete (Reaffirm - 1990)
456-2000	Code of practice for plain and reinforced concrete
516-1959	Method of test for strength of concrete (Reaffirmed in 2004)
1199-1959	Method of sampling and analysis of concrete
1200 (Pt.II)-1987	Methods of measurements of cement concrete work. (Reaffirm - 1992)
1322-1993	Bitumen felts for water proofing and damp proofing. (Reaffirm - 1998)
1661-1 987(Pt.I II)	Code of practice for application of cement lime plaster finishes.(Reaffirm- 1999)
2386-1977(Pt.1 to 8)	Methods of test for aggregate for concrete
2386 (Pt.I)-1 963	Test for particle size and shape
2386 (Pt.II)-1963	Test for estimation of deleterious materials and organic impurities
2386 (Pt.III)-1 963	Test for specific gravity, density, voids, absorption and bulking
2386 (Pt.IV)-1963	Mechanical properties
2645-1975	Specification for integral water proofing compounds
2686-1977	Specification for cinder aggregate for use in lime concrete. (Reaffirm - 1992)
3812-1981	Fly Ash using as pozzolana and admixtures for concrete. (Reaffirmed - 1999)
7861-1975 (Pt.I)	Hot weather concreting. .(Reaffirmed -1990)
7861-1981 (Pt.II)	Cold weather concreting. .(Reaffirmed -1992)
9103-1999	Admixture for concrete.

5. R.C.C. WORK

432-1982	Mild steel & medium tensile steel bars and hard drawn steel wire for concrete reinforcement.
432 (Pt.I)-1982	Mild steel and medium tensile steel bars
456-2000	Code of practice for plain and reinforced concrete
457-1957	COP for general const. of plain & reinforced concrete for dams & other massive structure.
516-1959	Methods of test for strength of concrete
1161-1963	Specifications for steel tubes for structural purposes
1199-1959	Methods of sampling and analysis of concrete. (Reaffirmed - 1999)
1200 (Pt.II) -1974	Method of measurement of cement concrete work
1200(Pt.V) -1982	Method of measurement of form work. (Reaffirmed - 1989)
1343-1980	Code of practice for pre-stressed concrete.
1566-1982 (Reff.1998)	Hard drawn steel wire fabric for concrete reinforcements (II Rev.)
1780-1961	Specifications for cold twisted steel bars for concrete reinforcement *
1785-1983(Part-I& II)	Specifications for plain hard drawn steel wire for pre-stressed concrete

1786-1985	H.Y.S.D./ Cold twisted steel bars for concrete reinforcement Reaffirmed - 1990)
2090-1983	Specifications for high tensile steel bars used in prestressed concrete.
2204-1962	Code of practice for construction of reinforced concrete shell roof. (Reaffirmed -1990)
2210-1988	Criteria for the design of shell structure and folded plates (Reaffirmed - 1998)
2502-1963	COP for bending and fixing of bars for concrete reinforcement. (Reaffirmed - 1999)
2750-1964	Specifications for steel scaffoldings
2751-1979 (Reaf-1992)	COP for welding of mild steel bars used for reinforced concrete construction.
3201-1988 (Reaffirmed - 1995)	Criteria for design and construction of precast concrete trusses.
3370.(Part I to IV)-1965 (Reaffirmed - 1999)	Code of practice for concrete structures for storage of liquids.
3385-1965 (Foundation)	Code of practice for measurement of Civil Engineering works - Pile
3414-1968 (Reaffirmed -1990)	Code of practice for design and installation of joints in buildings.
3558-1983(Reaf-91)	Code of practice for use of immersion vibrators for consolidating concrete
3696 (Pt.I & II) I-1987:	Safety code of scaffolds; II-1991: Safety code of ladders
3935-1966	Code of practice for composite construction. (Reaffirmed – 1998)
4014-1967 (Pt. & II)	COP for steel tubular scaffolding (I: Definition/Material; II: Safety Resolutions) (Raffirmed 1999)
4926-2003	Code of practice for Ready Mix Concrete
4990-1993 (1998)	Specifications for plywood for concrete shuttering work. (Reaffirmed - 1998)
10262-1982	Code of practice for design mix. (Reaffirmed - 1999)

6. EQUIPMENTS

460-1985 (Pt-I,II& III)	Specification for test sieves. (Reaffirmed - 1998)
1791-1985	Specification for batch type concrete mixer. (Reaffirmed – 1990)
2430-1986	Methods for sampling of Aggregates for concrete.
2505-1992	General requirement for concrete vibrators, immersion type
2506-1985	General requirements for screed board concrete vibrators
2514-1963	Specification for concrete vibrating tables. (Reaffirmed - 1991)
3366-1965	Specification for pan vibrators. (Reaffirmed – 1991)
4656-1968	Specification for form vibrators for concrete. (Reaffirmed-1991)
2722-1964(Reaf-95)	Specification for portable swing weighbatchers for concrete (single and double bucket type).
2750-1964	Specification for steel scaffolding. (Reaffirmed – 1991)

7. BRICK WORK:

1077-1992	Common burnt clay building bricks
1200 (Pt.III)-	19920 Method of measurements of brick work. (Reaffirmed - 1992)
2116-1980	Sand for masonry mortars. (Reaffirmed - 1998)
2212-1991	Code of practice for brick work

2250-1981	Code of practice for preparation & use of masonry mortar. (Reaffirmed - 1990)
3102-1971	Classification of burnt clay solid bricks
3495 (Pt.ItoIV)-	1992 Method for test for burnt clay building brick
5454-1978	Method for sampling of clay building bricks. (Reaffirmed - 1995)

8. STONE WORK:

1121 (Pt.I)-1974	Methods for determination of compressive, transverse & shear strengths of natural building stones
1122-1974	Methods for determination of specific gravity and porosity of natural building stones
1123-1975	Methods for identification examination of natural building stones
1124-1974	Methods of test for water absorption of natural building stones
1125-1974	Methods of test for weathering of natural building stones
1126-1974	Methods of test for durability of natural building stones
1129-1972	Dressing of natural building stones
1200 (Pt.IV)-1976	Method of measurement of stone masonry. (Reaffirmed - 1992)
1597-1992	Code of practice for construction of stone masonry
1597. (Pt.I)-1992	Code of practice for construction of Rubble stone masonry. (Reaffirmed - 1996)
1597 (Pt.II)-1992	Code of practice for construction of ashlar masonry (Reaffirmed - 1996)
1805-1973	Glossary of Terms relating to stone Quarrying and dressing. Reaffirmed - 1993)
4101 (Pt.I)-1967	Code of Practice for External Facings and veneers, Stone facing. (Reaffirmed - 1990)

9. MARBLE WORK:

1122-1974	Methods for determination of specific gravity and porosity of natural building stones
1124-1974	Methods of test for water absorption of natural building stones
1130-1969	Marble (blocks, slabs and tiles)

10. WOOD WORK:

204-1991/92	Tower bolts (Part I-1991: ferrous metals; Part II - 1992 : Non ferrous metals).
205-1992	Non-ferrous metal butt hinges
420-1953	Putty used on metal frame (withdrawn).
1734 - 1983	Methods of tests for plywood (IIR) (Ref 1993)
206-1992	Tee and strap hinges
207-1964	Gate and shutter hooks and eyes. (Reaffirmed - 1996)
208-1987	Door handles
281-1991	Mild steel sliding door bolts for use with padlocks
287-1973(Reaf-98)	Recommendation for maximum permissible moisture contents of timber used for Different purposes.
303-1989	Plywood for general purpose
362-1991	Parliament hinges
363-1993	Hasps and staples
364-1993	Fanlight catch
401-1982	Code of practice for preservation of timber
419 - 1967	Putty for use on window frame (I Rv.) (and out 3)

451-1999 Technical supply condition for wood screws
 452-1973 Door springs, rat-tail type(II Rev.) (Reaffirmed 1990)
 453-1993 Double acting spring hinges. (Reaffirmed – 1999)
 723-1972 Steel counter sunk head wire nails. (Reaffirmed - 1996)
 729.1979 Drawer locks, cup board locks, and box locks (III Rev.) (Reaffirmed 1992)
 848-1974 Synthetic resin adhesive for plywood (phenolic and aminoplastic) (I RV)
 851-1978 Synthetic resin adhesive for construction work (Non-structural) in wood (I-Rev.)
 (amt) (Reaffirmed 1990)
 852-1994 Specifications for animal glue for general wood working purposes. (II Rev)
 1003-1994 Timber panelled and glazed shutters
 1003(Pt.I)-2003 Door shutters (III Rev.) (a 1)
 1003 (Pt.II)-1994 Window and ventilator shutters (III Rev.)
 1019-1974 Rim latches. (Reaffirmed - 1991)
 1141-1993 Code of practice for seasoning of timber (II Rev.)

1200 Method of measurement of Building and Civil Engineering works
 1200 (Pt.XIV)-1984 Glazing. (Reaffirmed - 1990)
 1200 (Pt.XII)-1 973 Wood work and joinery. (Reaffirmed - 1992)
 1322-1993 Bitumen felts for water proofing and damp proofing.
 1328-1996 Veneered decorative plywood
 1341-1992 Steel Butt hinges (VI Rev.)
 1378-1987 Oxidized copper finishes. (Reaffirmed - 1998)
 1568-1970 Wire cloth for general purposes. (Reaffirmed - 1998)
 1629-1960 Rules for grading of out size of timber. Superseded in I.S. 1331
 1658-1977 Fiber hard board. (Reaffirmed - 1990)
 1659-2004 Block boards
 1708-1986 Method of testing of clear speciman of timber (II Rev) (Q.1) (Reaffirmed 1990)
 1823-1980 Floor door stoppers. (Reaffirmed - 1992)
 1868-1996 Anodic coating on Aluminium & its alloy (II Rev.) (Reaffirmed 1991)
 875-PET 1987 Dead locds – Unit not of bldg. & stored materials

2191-1983 Wooden flush door shutter (cellular and hollow core type). (Reaffirmed - 1991)
 1837 - 1966 For light pirot (I Rev.) (Reaffirmed 1990)
 2095-1982 Gypsum plaster bow (I Rev) (an.1) (Ref. 1991)
 2096-1992 A.C. flat sheet (I Rev.)
 3828 - 1968 Ventilator chains (Reaf. 1990)
 4835 - 1979 Polyvinyl acatete dispssion base adhesive for wood (1990)
 2191 (Pt.I)-1983 Plywood face panels. (Reaffirmed - 1991)
 2191 (Pt.II)-1983 Particle board face panels and hard board face panels. (Reaffirmed-1991)
 2202-1999 Wooden flush door shutters (solid core type)
 2202 (Pt.I)-1999 Plywood face panels for wooden flush door shutters
 2202 (Pt.II)-1983 Particle board face panels for wooden flush door shutters. (Reaffirmed -
 1991)
 2209(Pt.I)-1976 Mortise locks (vertical type) (Reaffirmed 1992)
 2380-1981 Method of test for wood particle board and boards from lignocellulosic materials
 (Reaf.1993)
 2681-1993 Non ferrous metal sliding door bolts(aldrop) for use with pad locks

2835-1987 Flat transparent sheet glass (3rd Revision). (Reaffirmed - 1992)
 3087-1985 Wood particle boards (medium density) for general purpose (1990)
 3097-1980 Veneered particle boards (1st Revision).

3400 (Part I)-1987 Method of test for vulcanized rubbers (1991)
 3400-(Pt.II)-2003 Hardness (1981)
 3400-(Pt.IV)-1 987 Accelerated aging (1993)
 3400 (Pt.IX)-2003 Relative density and density. (Reaffirmed - 1990)
 3564-1996 Door closers (Hydraulically regulated)
 3618-1966 Phosphate treatment of iron and steel for protection against corrosion.
 (Reaffirmed - 1991)
 3813-1967 'C' hooks for use with swivels (1992)
 3818-1992 Continuous (Piano) hinges
 3847-1992 Mortise night latches
 4020-1998 (1 to 16) Methods of tests for wooden flush Doors (Type tests)
 4021-1995 Timber door, window and ventilator frames
 4827-1983 Electroplated coating of nickel and chromium on copper and copper alloys
 4948-2002 Welded steel wire fabric for general use. (Reaffirmed - 1992)
 4992-1975 Door Handles for mortise locks (vertical type). (Reaffirmed - 1990)
 51 87-1972 Flush bolts (1990)
 5523-1983 Method of testing anodic coating on aluminium & its alloys. (Reaffirmed -1991)
 5930-1970 Mortise latch (vertical types) (1991)
 6318-1971 Plastic window stays & fasteners
 6607-1972 Rebated mortise locks (vertical type)
 6760-1972 Slotted countersunk head wood screws. (Reaffirmed - 1988)
 71 96-1974 Hold fasts (1992)
 71 97-1974 Double action floor springs (without oil check) for heavy doors
 7534-1985 Sliding locking bolt for use with padlocks. (Reaffirmed – 1991)
 8756 - 1978 Mortice bell catches for use in wooden almirah (1992)
 14856-2000 Glass fibre reinforced plastic (GRP) panel type door shutters for internal use –
 Specifications

11. STEEL WORK

63-1978 Whiting for paints. (Reaffirmed - 1994)
 198-1978 Varnish, gold size. (Reaffirmed - 1991)
 12406 - 1988 Medium density fibre board for general purpose - (1992)
 277-2003 Specification for galvanised steel sheets (plain and corrugated)
 278-1978 Galvanised steel barbed wire for fencing. (Reaffirmed - 1991)
 800-1984 Code of practice for use of structural steel in general building construction
 806-1968 Code of practice for use of steel tube in general building construction
 813-1986 Scheme of symbols for welding. (Reaffirmed – 2003).
 814-1991 Covered electrodes for metal arc welding of structural steel (Reaffirmed 2003)
 814 (Pt-I)-1974 For welding products other than sheets. *
 814 (Pt-II)-1974 For welding sheets. *
 817-1966 Code of practice for training and testing of metal arc welders. (Reaffirmed –
 2003)
 818-1968 (Reaf-03)COP for safety & healthy requirements in electric & gas welding &
 cutting operation.
 1038-1983 Steel doors, windows and ventilators
 1081-1960 (Reaf-91) COP for fixing & glazing of metal (steel & aluminium) doors, windows
 & ventilators

- 1148-1982 (Reaf-92) Hot rolled steel rivet bars (upto 40 mm diameters)for structural purposes (Reaffirmed 2001)
- 1161-1998 Steel tubes for structural purposes
- 1182-1983 (Reaf-00) Recommended practice for radiographic examination of fusion welded butt joints in steel plates.
- 1200 (Pt-VIII)-1993 Method of measurements of steel work and iron works
- 1363-1992 (Pt. 1- 3) Hexagon bolts, nuts & lock nuts (dia. 6 to 39 mm) & black hexagon screws (dia. 6 to 24 mm).(Reaf-98)
- 1599-1985 (Reaf-91) Method for bend test for steel products other than sheet, strip, wire & tube (reaffirmed 1996).
- 1608-1995 Method for tensile testing of steel products (Reaffirmed 2001)
- 1821-1987 Dimensions for clearance holes for metric bolts. (Reaffirmed - 2003)
- 1852-1985 Rolling and cutting tolerance for hot rolled steel products. (Reaffirmed - 1991)
- 1977-1969 Structural steel (ordinary quality) (Reaffirmed 2001)
- 2062-1999 Structural steel (fusion welding quality). Supersedes IS 226-1 975
- 4351-2003 Steel door frames. (Reaffirmed – 1991)
- 4736-1986 Hot-dip zinc coatings on steel tubes. (Reaffirmed – 2001)
- 6248-1979 Metal rolling shutters and rolling grills
- 7452-1990 Hot rolled steel sections for doors, windows & ventilators.

12 . FLOORING :

- 210-1993 Grey iron casting (Reaffirmed 1999)
- 653-1992 Sheet linoleum
- 777-1988 Glazed earthen-ware tiles
- 809-1992 Rubber flooring materials for general purpose
- 1122-1974 Methods for determination of specific gravity (*and porosity of natural building stones)
- 1124-1974 Method of test for water absorption of natural building stones
- 1130-1969 Marble (blocks, slabs and tiles) (Reaffirmed – 1993)
- 1197-1970 Code of practice for laying of rubber floors. (Reaffirmed – 1990)
- 1198-1982 Code of practice for laying and maintenance of linoleum floors
- 1200 (Pt.XI)-1977 Method of measurements of pavings and floor finishes.
- 1237-1980 Cement concrete flooring tiles. (Reaffirmed – 1990)
- 1443-1972 Code of practice for laying and finishing of cement concrete flooring tiles
- 1661-1972 Code of practice for application of cement and cement lime plaster finishes
- 2114-1984 Code of practice for laying in situ terrazzo floor finish
- 2571-1970 Code of practice for laying in situ cement concrete flooring
- 9197-1979 Specifications for epoxy resin, hardeners and epoxy resin compositions for floor topping (Reaffirmed – 2001)
- 13630 (Pt.1 to 13) Methods of tests for ceramic tiles (Part 1 to 13 : 1992-1993)

13 . ROOFING :

- 73-1 992 Paving Bitumen (Reaffirmed 1998)
- 277-2003 Galvanised steel sheets (plain and corrugated)
- 458-2003 Concrete pipes (with and without reinforcement)
- 459-1992 Unreinforced corrugated and semicorrugated asbestos cement sheets
- 651-1992 Salt glazed stone ware pipes and fittings
- 702-1988 Industrial Bitumen
- 1199-1959 Method of Sampling & Analysis of concrete. (Reaffirmed - 1991)

- 1200 (Pt.IX)-1973 Method of measurements of roof covering (including cladding)
- 1200 (Pt.X)-1973 Method of measurements of ceiling and lining
- 13607 – 1992 Ready Mixed Paint, Finishing, General Purposes, Synthetic (Reaffirmed 2002)
- 1322-1993 Bitumen felts for water proofing and damp-proofing. (Reaffirmed -1988)
- 1346-1991 Code of practice for waterproofing of roof with bitumen felts
- 1609-1991 Code of practice for laying damp proof treatment using bitumen felts
- 1626-1994(PartI-III) Asbestos cement building pipes, gutters and fittings (Spigot and socket types)
- 1834-1984 Specification for hot applied sealing compounds for joints in concrete. (Reaffirmed - 1990)
- 1838-(Pt.I & II)- 1983 Preformed filler for expansion joints in concrete- non-extruding and resilient typeBitumen impregnated fiber). (Reaffirmed - 1990)
- 2115-1980 Code of practice for flat roof finish:mud phuska. (Reaffirmed - 1998)
- 2633-1986 Method of testing uniformity of coating on zinc coated articles. (Reaffirmed – 2001)
- 3348-1965 Fiber insulation boards. (Reaffirmed - 1990)
- 71 93-1994 Specifications for glass fiber base coal tar Pitch & Bitumen felts.

14. FINISHING

- 75-1973 Linseed oil, raw and refined. (Reaffirmed – 2003)
- 77-1976 Linseed oil, boiled, for paints. (Reaffirmed - 1999)
- 102-1962 Ready mixed paint, brushing, red, lead, non setting, priming. (Reaffirmed - 1996)
- 104-1979 Specification for ready mixed paint, brushing, zinc chrome, priming. (Reaffirmed - 1999)
- 133-1993 Enamel, interior (a) under coating (b) finishing colour as required
- 137-1965 Ready mixed paint, brushing, matt or egg-shell flat, finishing, interior, to Indian Standard Colour, as required. (Reaffirmed – 1999)
- 158-1981 Ready mixed paint, brushing, bituminous, black lead free acid alkali, water and heat resisting for general purposes. (Reaffirmed – 1999)
- 168-1993 Ready mixed paint, air drying for general purpose.(Reaffirmed 2002)
- 217-1988 Cut back bitumen (reaffirmed 1999)
- 218-1983 Creosote and anthracene oil for use as wood preservatives (Reaffirmed 1998)
- 290-1961 Coal tar black paint. (Reaffirmed – 1996)
- 337-1975 Varnish, finishing interior. (Reaffirmed – 2001)
- 341-1973 Black Japan, types A, B, and C (Reaffirmed 2002)
- 347-1975 Varnish, shellac for general purpose. (Reaffirmed – 2001)
- 348-1968 French polish. (Reaffirmed – 2001)
- 419-1967 Putty for use of window frames. (Reaffirmed – 2001)
- 427-1965 Distemper, dry, colour as required. (Reaffirmed – 1999)
- 428-2000 Washable distemper
- 524-1983 Varnish, finishing, exterior, synthetic. (Reaffirmed – 2000)
- 525-1968 Varnish, finishing, exterior and general purposes. (Reaffirmed –2001)
- 533-1998 Gum spirit of turpentine (oil of turpentine) (Reaffirmed 2003)
- 712-1984 Specification for building limes. (Reaffirmed - 1995)
- 1200 (Pt. XII)-1976 Method of measurements of plastering and pointing
- 1200 (Pt.XIII)-1994 Method of measurements of white washing, colour washing, distemping and other finishes
- 1200 (Pt.XV)- 1987 Methods of measurements of painting, polishing & varnishing.

2095-1996 (Pt.I - III) Gypsum plaster boards
 2096-1992 Asbestos cement flat sheets.
 2339-1963 Aluminium paint for general purposes, in dual container. (Reaffirmed – 1999)
 2547-1976 (Pt I & II) Gypsum building plaster (Reaff. 1992)

2932-2003 Enamel synthetic, exterior (a) Under coating (b) Finishing.
 2933-1975 Enamel, Exterior (a) Under coating (b) Finishing
 5410-1992 Cement paint (Reaffirmed 1999)
 5411 (Pt.I)-1 974 Plastic emulsion paint for interior use. (Reaffirmed – 1993)
 6278-1971 Code of practice for white washing & colour washing. (Reaffirmed -1991)

15. DEMOLITION AND DISMANTLING:

1200(Pt.XVIII)-1974 Method of measurements of demolition and dismantling

16. SAFETY CODES

818-1968 (Reaf-03) Safety and healthy requirements in Electric and gas welding and cutting operations.
 3696 (Pt.I)-1 987 Safety code for scaffolds
 3696 (Pt.II)-1991 Safety code for ladders
 3764-1992 Safety code for Excavation works
 4081-1986 Safety code for blasting and related drilling operation
 4130-1991 Safety code for Demolition of Building
 5916-1970 Safety code for construction involving use of hot bituminous materials
 6922-1973 Structural subject to underground blasts code of practice for safety and design of structure subject to underground blasts.
 7293-1974 Working with construction machinery- safety code for

3. EXCAVATION AND EARTHWORK:

- 3.1. **GENERAL** The excavation will generally refer to open excavation of foundation wet or dry and in all sorts of soils.
- 3.2. **EXAMINE THE SITE** The Contractor shall visit and ascertain the nature of the ground to be excavated and the work to be done and shall accept all responsibility for the cost of the work involved.
- 3.3. **SETTING OUT** The contractor shall set out the building or other involved works after clearing the site and get the same approved by Procuring Entity/Architects. It shall be the responsibility of the Contractor to install substantial reference marks, bench marks etc. and maintain them as long as required by the Procuring Entity/Architects. The contractor shall assume full responsibility for proper setting out, alignment, elevation and dimension of each and all parts of the work.
- 3.4. **GROUND LEVEL AND SITE LEVEL** Before commencement of excavation, spot levels on an approved grid covering the entire plot shall be taken by the Contractor in consultation with the Procuring Entity/Architects and a proper record of these levels shall be kept jointly signed by the Contractor and the Procuring Entity/Architects. A

block level plan showing all ground levels of the plot shall be prepared by contractor and shall also be jointly signed by the Contractor and the Procuring Entity/Architects.

3.5. EXCAVATION & PREPARATION OF FOUNDATION FOR CONCRETE

Excavation shall include removal of all materials of whatever nature at all depths and whether wet or dry necessary for the construction of foundation and sub-structure (including mass excavation for basement underground reservoir where applicable) exactly in accordance with lines, levels, grades and curves shown in the drawings or as directed by the Procuring Entity/Architects. The bottoms of excavation shall be levelled both longitudinal and transversely or sloped as directed by the Procuring Entity/Architects. Should the contractor excavate to a greater depth or width than shown on the drawings or as directed by the Procuring Entity/Architects, he shall at his own expense fill the extra depth or width in cement concrete in proportion as to be directed by the Procuring Entity/Architects but in no case with concrete of mix leaner than 1:4:8 cement concrete. The contractor shall report to the Procuring Entity/Architects when the excavations are ready to receive concrete. No concrete shall be placed in foundations until the contractor has obtained Procuring Entity/Architects approval. In case, the excavation is done through different types of soil and if different rates are applicable as per provision in the Schedule of Quantities, the contractor must get the dimensions of the strata agreed by the Procuring Entity/Architects for payment. If no specific provisions is made in the schedule of quantities it will be presumed that excavation shall be in all types of soil and the contractor's rate shall cover for the same.

After the excavation is passed by the Procuring Entity/Architects and before laying the concrete, the contractor shall get the depth and dimensions of excavation and levels (and nature of strata as applicable as per Schedule of Quantities like hard rock, soft rock) and measurements recorded by the Procuring Entity/Architects.

- 3.6. SHORING** The sides of the excavations should be timbered and supported in such a way as is necessary to secure these from falling in, and the shoring shall be maintained in position as long as necessary. The contractor shall be responsible for the proper design of the shoring to be approved by Procuring Entity/Architect to hold the sides of the excavation in position and ensure safety of persons and properties etc. The shoring shall be removed as directed after the items for which it is required are completed. Unless otherwise mentioned in the Schedule of Quantities no extra payment will be made for shoring.

3.7. PROTECTION

If instructed by the Procuring Entity/Architects all foundation pits, and similar excavations shall be strongly fenced and marked with red lights at night to avoid accidents. Adequate protective measure shall be taken to make sure that the excavation does not affect or damage adjoining structures. All measures required for the safety of excavations, the people working in & around the foundation trenches, property and the people in the vicinity shall be taken by the contractor at his own cost. He shall be entirely responsible for any injury and damage to property caused by his negligence or accident due to his constructional operations, storage of materials etc.

3.8. STACKING OF EXCAVATED MATERIALS

All materials excavated will remain the property of the Procuring Entity and rate for excavation shall include sorting out of useful materials and stacking them on site as

directed. Materials suitable and useful for back filling, plinth filling or levelling of the plot or other use shall be stacked in convenient places but not in such a way as to obstruct free movement of men, animals and vehicles or encroach on the area required for constructional purposes.

3.9. BACKFILLING

All shoring and form work shall be removed after their necessity ceases and trash of any sorts shall be cleaned out from the excavation. All space between foundation masonry or concrete and sides of excavation shall be refilled to the original surface with approved excavated materials in layers 20 cm in thickness watered and rammed. The filling shall be done after concrete or masonry is fully set and done in such a way as not to cause undue thrust on any part of the structure. Where suitable excavated materials are to be used for refilling it shall be brought from the place where it is temporarily stacked and used in refilling. No excavation of foundations shall be filled in or covered up until all measurements of excavations, masonry concrete and other works below ground level are jointly recorded. Black cotton soil shall not be used for back filling or in plinth filling.

3.10. DEWATERING

Rates for excavation may include bailing or pumping out water which may accumulate in the excavation during the progress of work either from seepage, springs, rain or any other cause and diverting surface flow if any by bunds or other means. Pumping out of water shall be done in such approved manner as to preclude the possibility of any damage to the foundation trench concrete or masonry or any adjacent structure. When water is met in foundation trenches or in tank excavations, pumping out water shall be carried out from auxiliary pit of adequate size dug slightly outside the building excavations. The depth of auxiliary pit shall be more than the working foundation trench levels. The auxiliary pit shall be refilled with approved excavated materials after the dewatering is over. The excavation shall be kept free from water :- a) during inspection and measurement. b) when concrete and/or masonry works are in progress and till they come above the natural water level and c) till the Procuring Entity/Architects consider that the concrete/mortar is sufficiently set.

3.11. SURPLUS EXCAVATED MATERIALS:

All excavated materials certified as surplus and not useful shall be removed by the Contractor from the site in an approved manner with the approval of the Local Authority as required to his own dump and shall be paid as a separate item as in the Schedule of Quantities. No extra claim on any account will be paid. The items of removal of surplus excavated materials shall only be undertaken by the Contractor when specific instruction in this regard has been obtained from the Procuring Entity/Architects. The contractor must also secure the approval of the Procuring Entity/Architects regarding the quantity of surplus materials to be removed prior to commencement of this item of work.

3.12. RATES TO INCLUDE FOR EXCAVATION ITEMS

Apart from other factors mentioned elsewhere in this contract, rates for the item of excavation shall also include for the following:-

- 3.12.1. Clearing Site
- 3.12.2. Setting out works as required.
- 3.12.3. Providing shoring and shuttering to avoid sliding of soil and to protect adjacent structures and subsequently by removing the same, if not started separately in the schedule of quantities.

- 3.12.4. Bailing and pumping out water as required and directed if not being measured and paid separately.
- 3.12.5. Excavation at all depth (unless otherwise specified in the Schedule of quantities) and removal of all materials of whatever nature wet or dry and necessary for the construction of foundation underground reservoir etc. and preparing bed for laying concrete.
- 3.12.6. Sorting out useful excavated materials and conveying beyond the structure and stacking them neatly on the site for back filling or re-use as directed.
- 3.12.7. Necessary protection works involving, labour, materials, and equipment to ensure safety and protection against risk or accident.
- 3.12.8. Drilling of small holes as directed to explore the nature of substrata if necessary.

3.13. MEASUREMENT FOR EXCAVATION

Excavation for foundation of columns, beams, walls and the like shall be measured and paid net as per drawing, dimensions of concrete (bed concrete where so specified) and the lowest level in regard to length and breadth and depth shall be computed from the excavation levels and ground levels taken before excavation for that area. Any additional excavation required for working space, form work, planking, shuttering for concrete work, dewatering and strutting etc. shall not be measured and shall not be paid for separately but rates quoted for excavation shall include for all these factors. No increase in bulk after excavation shall be allowed.

3.14. RATES TO INCLUDE FOR BACKFILLING ITEM

3.14.1 Apart from other factors mentioned elsewhere in this contract, rates for the item of backfilling item of work shall also include for the following:-

- i) Backfilling the trenches alongside masonry or concrete with approved excavated materials up to the natural ground level in layers as specified including watering and ramming.
- ii) Earth filling in Plinth

3.14.2 If there is approved surplus earth after backfilling the sides of excavations, the same will be used for plinth filling if required. Any additional quantities of good quality earth, if required for plinth filling, shall be brought to the site, by the contractor from outside. No borrow pits shall be opened on the site. Filling in plinth shall be done in layers of 20 cm thick each layer being consolidated by ramming and watering. The payment of back filling item shall be made on measurement of finished consolidated quantity, arrived by difference levels taken before and after the back filling.

3.14.3 No payment shall be made for backfilling to the trenches excavated by the contractor for working space, form work, planking, shuttering for concrete work, dewatering and strutting etc with approved excavated materials upto the natural ground level in layers as specified including watering and ramming.

4. CONCRETE

4.1. GENERAL

4.1.1. SUPERVISION

A competent person approved by the Procuring Entity/Architects shall be employed by the contractor whose first duty will be to supervise all stages in the preparation and placing of the concrete. All cubes should be made and necessary site tests carried out under his direct supervision in the presence of Procuring Entity/Architects.

4.1.2. APPROVAL OF CONCRETING ARRANGEMENT ETC.

Before commencement of construction the contractor shall submit detailed arrangements for concreting, system of form work and all other devices which he proposes to use for the construction of structural frame work for approval of Architects/Procuring Entity.

4.1.3. SAMPLE AND TESTS

Every facility shall be provided by contractor at site to enable the Procuring Entity/Architects to select samples, get contractor to collect samples and carry out tests on the materials and construction. At least 10% of the cube tests should be carried out in Laboratory/ Institution approved by the Architect/Procuring Entity. If those tests shows that strength of cubes do not comply with the acceptance criteria of specifications, the contractor will be responsible for replacement of the defective construction. The necessary cost of all such sampling and testing has to be borne by the contractor.

4.1.4. REJECTED MATERIALS

All materials which have been damaged, contaminated or have deteriorated or do not comply in any way with the requirements of this specification, shall be rejected and shall be removed immediately from the site at the Contractor's own expense.

4.1.5. LOADING OF FLOOR SLABS

No materials shall be stored or stacked on suspended floors and roofs without the Procuring Entity's/Architects' prior approval.

4.1.6. CO-ORDINATION

The Contractor shall be responsible for the co-ordination with sub-contractors or other contractors for incorporating any inserts, electrical conduit pipes, fixing blocks, chases, holes etc in concrete members brick works as required. The contractor shall ensure that these requirements have been approved by the Procuring Entity/Architects before the operations are put in hand. All blocks, chases, inserts, holders etc. to be left in the concrete shall be of the sizes specified and be accurately set out and placed before pouring concrete.

The Contractor's rates quoted for concrete items shall include all these factors. No holes and chases shall be cut in concrete without prior approval of the Procuring Entity/Architects.

4.1.7. INSERTS TO CONCRETE

The contractor should note that he shall provide necessary wooden plugs, m.s inserts, sleeves etc. required for the works for which no extra payment will be made. He will have to provide if so directed, any inserts, wooden plugs sleeves for other contractors, such as Electrical Contractor, Fire Fighting Contractors, Contractor for Lifts etc for which

he will be entitled for payment but in case the other contractors provide such inserts, then he will have to take proper measures (at his expense) and care not to disturb their work while laying concrete.

4.1.8. EQUIPMENT

The contractor shall keep at work site testing equipment for aggregate and concrete, viz. test sieves, balance, slump cones, concrete cube testing machine etc all items required conforming to relevant I.S. specification. Dial gauge of cube testing machine should have been calibrated recently from a Govt approved laboratory.

4.2. MATERIALS

All materials shall be of approved quality as per relevant I.S. specifications/or as specified in the contract.

4.2.1. CEMENT

- i. Ordinary Portland cement and Portland Slag Cement shall conform to the I.S. specification I.S. 269 and IS 455 of latest edition.
- ii. Cement at site shall be stored in dry weather proof godowns (or shed) built at the cost of the contractor. Cement must not be stacked in more than 10 bag height. Sufficient space shall be provided for circulation and rotation of bags in order to minimise the length of storage of any of the bags. The floor of the godown shall consist of wooden planks resting on base prepared of dry bricks laid on edge.
- iii. The contractor shall be fully responsible for the quality of cement brought by him at the work site. The contractor shall ensure that the cement brought to the work site conforms to the requirements of IS 269 or IS 455 and shall procure manufacturer's certificate to this effect, in his own interest. Samples of Cement Lots need to be tested as per IS standards and records of the same shall be kept at site. Change of source of cement for the Batching shall be tested again.
- iv. Procuring Entity/Architects can order on the contractor to have the cement tested or they can take samples in the presence of contractor from cement bags stored at work site and forward them to a approved Laboratory for testing & the contractor shall be responsible for the cost of testing including transporting of samples to the laboratory. Daily record of cement received and consumed shall be maintained by the Contractor in cement register at site and submitted to Architects if called for. Theoretical consumption vis-a-vis materials brought at site by the Contractor shall also be submitted with proper documents with every bill for verification. A chart showing the consumption of cement for different items of work is annexed. Consumption of cement in the corresponding items of work under the contract shall be computed on the basis of the quantities shown in the table subject to a variation of plus/minus three per cent (The weight of 1 cum of cement shall be taken as 1,440 kg). For the items not available in the enclosed cement consumption chart, C.P.W.D schedule shall be followed.
- v. Cement of doubtful quality shall not be used until satisfactory results are obtained after testing. All cement not conforming to specifications and cement that has deteriorated, damaged or set shall not be allowed to be used. All such cement shall be immediately removed from work site by the contractor. The cost of all such cement shall be borne by the contractor.

4.2.2. AGGREGATE

Aggregate shall conform to IS 383 of latest edition.

4.2.3. FINE AGGREGATE : SAND

- a) The fine aggregate - sand shall be hard, strong, dense, durable clean with uncoated grains. The maximum size of the particles shall be 4.75 mm (3/16 in) and shall be graded down. The sand shall not contain any harmful materials such as iron, Pyrites, coal, mica, silt, clay, alkali, sea shells organic impurities, loam etc. or in case of reinforced concrete work, any materials which might attack the reinforcement or detrimental to concrete. Aggregate, which are chemically reactive with the alkalies of the cement, shall not be used. The maximum quantity of deleterious materials shall not exceed the limit specified in the relevant I.S. Specifications. The silt content shall be within 8%.
- b) Grading : The natural sand used for work shall have a grading conforming to grading zones of I and II of I.S. 383 of latest edition.

4.2.4. COARSE AGGREGATE

- a) Coarse aggregate shall consist of hard, dense, durable uncoated crushed rock. Gravel aggregate shall be allowed to be used only if specially specified in the bill of quantities. Otherwise it shall be taken that only crushed rock shall be permitted as coarse aggregate.
- b) The aggregate shall be free from soft, friable thin or long laminated pieces. Aggregate shall be free from injurious amounts of alkali, organic matter and other deleterious materials. Flaky or weathered stones shall not be used. The maximum percentage of deleterious materials shall not exceed those specified in the relevant I.S. specification.
- c) The contractor shall arrange to supply coarse aggregate of nominal size conform to the grading in the limits specified in I.S. 383 of latest edition.
- d) Size of Aggregate :
- i) Generally for reinforced concrete work, nominal maximum size of aggregate be 20 mm graded suitably.
- e) In selecting the aggregate, the contractor shall satisfy himself that the source is suitable for regular supply and a watch shall be maintained that the particles shape and grading remain reasonably uniform throughout the progress of work.
- f) Where so directed by Procuring Entity/Architects aggregate shall be washed by approved methods at Contractor's expenses. Change of source of aggregates would result in revised Design Mix for Concrete.

4.2.5. WATER

Water used for both mixing and curing shall be clean and free from injurious amounts of deleterious materials which are likely to affect the strength or durability of concrete. Water containing any sugar shall not be allowed for use. Water is to be tested in accordance with I.S. 456 of latest edition. The pH values of water shall generally be not less than 6.

4.3. MIXING AND PLACING OF CONCRETE

4.3.1. CEMENT

Cement shall be batched by weight even though aggregate are batched by volume. Where the weight of the cement is determined by accepting the maker's weight per bag, a number of bags as directed by Procuring Entity/Architects shall be weighed separately to check the net weight. Where the cement is weighed on the site and not in bags, it should be weighed separately from Aggregate.

4.3.2. AGGREGATE

The aggregate shall be batched by volume, the form as used shall be of the correct sizes to be certified by the Procuring Entity/Architects before use. Heaping of aggregates on the form is prohibited and aggregates shall be filled level in form and struck off with a horizontal timber or steel rule. Where sand is measured by volume, bulkage allowance as determined by the Procuring Entity/Architects shall be accounted for while measuring sand.

4.3.3. WATER

Water shall be measured either by volume in calibrated tanks/vessels having conical shape narrow at top or water shall be weighed. Water shall not be measured using ordinary buckets which are wider at top and narrower at the base. The measurement of water to control and maintain a constant water cement ratio is of utmost importance and adequate attention to this end by the contractor to the satisfaction of the Procuring Entity/Architects shall be made so as to produce concrete of adequate workability as required.

4.3.4. MIXING OF CONCRETE

i. Machine Mixing :

Concrete shall be mixed in Mechanical Mixer. Mixing shall be continued until there is uniform distribution of materials and the mass is uniform in colour and consistency. The mixing time from the time of adding water shall be in accordance with I.S. 1791 of latest edition but in no case mixing shall be done for less than two minutes.

ii. Hand Mixing :

Hand mixing shall not be permitted except for unimportant structural members and purely at the discretion of the Procuring Entity/Architects. When hand mixing is permitted it shall be taken to ensure that the mixing is continued until the mass is uniform in colour and consistency. If hand mixing is permitted by the Architects/ Procuring Entity, the contractor shall use 10% extra cement for hand mixing for which no extra payment will be made.

4.3.5. TRANSPORTING, PLACING, COMPACTION AND CURING OF CONCRETE

4.3.6. TRANSPORTING

Concrete shall be handled from the place of mixing to the place of final deposit as rapidly as practicable, by method which will prevent the segregation or loss of any of the ingredients. If segregation occurs during transport, the concrete shall be remixed before use. The concrete shall be placed in position and compacted before the initial set of cement has commenced and shall not be subsequently disturbed. During hot or cold weather concrete shall be transported in deep container to reduce loss of water by evaporation during hot weather and loss of heat during cold weather. Deep containers are specified on account of their lower ratio of surface area to mass.

4.3.7. DROPPING OF CONCRETE

Concrete shall not be dropped into position from a height greater than 1.0 metre unless directed otherwise by Procuring Entity/Architect.

4.3.8. DEBRIS ETC. REMOVED

All debris, saw dust etc. shall be removed from the shuttering before any concrete is placed. Care shall be taken to see that the shuttering is water-tight and has been properly treated with approved composition to prevent absorption of water.

4.3.9. PROTECTION AND PLACING IN LAYERS

Concrete shall be placed into the forms in layers not exceeding 300 mm (approx) in thickness. Concrete after placing and finishing shall be protected by use of covering as approved by the Procuring Entity/Architects during first stage for hardening against high winds, heat, rain, surface water etc. No shock or vibration shall be allowed to be imparted to forms supporting fresh finished concrete.

4.3.10. COMPACTION

Concrete shall be thoroughly compacted during operation of placing by the use of Mechanical Vibrators. Sufficient number of vibrators (including stand by) of adequate capacities shall be used for compaction of concrete. Vibration shall be carried out by trained men and in the presence of a qualified supervisor trained in the use of vibrators and vibrated concrete. In certain portions where vibration is not effective, careful rodding and taping shall be carried out and sufficient men employed to ensure that thorough consolidation takes place. Where manual compaction becomes necessary, the workability of the mix should be controlled to strength requirement.

4.3.11. CONTINUOUS CONCRETING

Concreting shall be carried out continuously up to predetermined positions of construction joints. The position and arrangement, for construction joints shall be approved by the Procuring Entity/Architect. Rest pauses for meals etc. shall be subject to the Procuring Entity's/Architects approval.

4.3.12. PACKING ROUND REINFORCEMENT

In the case of reinforced concrete work, the concrete shall be carefully consolidated and packed round the reinforcement and care shall be taken to ensure that reinforcement is not displaced during the placing and compaction of concrete. If reinforcement moves out of its place, it must be brought back in position immediately.

4.3.13. CURING

All concrete work shall be water cured for a minimum period of 7 days after concreting or as directed by Procuring Entity/Architects. Horizontal surfaces shall be kept covered with water ponded by means of bunds and vertical surfaces like those of columns, fins etc. by burlaps kept constantly wet with water sprays. Mere sprinkling of water on vertical surface without sacks will not be allowed. In respect of concrete made out of pozzalana cement, curing shall be continued for another 8 days.

4.3.14. TRAINED SUPERVISOR

It is essential that the contractor's supervisor who is in charge of the construction of all concrete work whether reinforced or not, shall be skilled in this class of work and shall superintend personally the whole construction and pay special attention to :- a) the quality, testing, proportioning and mixing of the materials and particularly control of water cement ratio b) Laying of materials in place and thorough consolidation of the concrete to ensure solidity and freedom from voids. c) Position of reinforcements.

4.4. CONSTRUCTION JOINTS

4.4.1. GENERAL

- a) Location

The position of all construction joints shall be as approved by the Procuring Entity/ Architects. The contractor shall submit details of the location where he proposes to provide construction joints for the approval of the Procuring Entity/Architects.

b) Stop Boards

All vertical construction joints shall be formed with proper wooden stop board at the joints. Where directed, the joint shall be rebated or joggled and of approved shape.

c) Water Bar & Water Sealer

Wherever shown in the drawing or whenever instructed by the Procuring Entity/Architects water bar or water sealer of approved quality shall be used in construction joints for R.C. works. It is necessary to ensure that water bars form continuous diaphragms. The water bars shall be made out of special chemically treated rubber materials for retaining the flexibility indefinitely. Unless otherwise instructed by the Procuring Entity/Architects the water bars shall be "Centre Bulb type" corrugated and with end grip of approved quality. These shall be of any width as mentioned in the Schedule of Quantities and 10 mm thickness or other sizes & thickness approved by the Architects/Procuring Entity. The rate for supplying and fixing water bar in construction joints shall also include all appliances necessary for fixing the same in position as well as the extra cost for all necessary inter-section pieces.

4.4.2. CONSTRUCTION JOINTS IN SUPERSTRUCTURES :

a) Column

Joints shall be formed horizontally above top of foundation and 75 mm below the lowest soffit of the beams meeting at the head of the column. Concrete in the head of a column where one or more beams meet shall be placed at the same time that in the beam or beams without any joint.

b) Beams

Concrete in the beams shall be placed throughout without a joint.

c) Slab & waffle slabs

No construction Joints shall be allowed in Slabs. The waffle Slabs also should be cast in-situ uniformly in one pour.

d) Treatment of Construction Joints

i) When work is resumed on the surface which has hardened such surface shall be roughened. It shall be thoroughly cleaned and wetted and covered with a 12mm layer of mortar composed of cement and sand in the same ratio as cement and sand in the concrete mix. This 12 mm layer of mortar shall be freshly mixed and placed immediately before the placing of the concrete.

ii) Where the surface has not fully hardened the laitance shall be removed by scrubbing the wet surface with wire bristle brush, care being taken to avoid dislodgement of aggregates. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with neat cement grout.

iii) Care shall be taken to obtain good bond between the hardened and freshly placed concrete. Ramming and moulding of concrete around water bar shall be carefully carried out. Labour and materials for treatment of concrete joints are to be included in the rate of respective items.

4.4.3. EXPANSION JOINTS:

i. Expansion joints shall be provided as shown in the drawings.

ii. Expansion joints are meant to provide discontinuity in the structure. Care shall be taken to ensure this discontinuity by having clear joints throughout the length and height of the expansion joints. There shall be no connection between two sides of an expansion joint except with the materials used to form the expansion joints like fillers, water bar and other materials indicated in the drawings.

iii. Unless otherwise specified, the filler materials for Expansion joints shall be shalitek joint filler as manufactured by M/s. Shalimar of appropriate thickness. The filler materials shall

- extend to the entire depth of the joint except for a distance of 25 mm from the exposed faces as shown in the drawing.
- iv. Expansion joints shall be leak proof and the Contractor shall be responsible for any leakages and resulting damages.

4.4.4. TESTS FOR CONCRETE

Tests shall be conducted in accordance with IS standards.

4.4.4.1. TEST CUBES

- i) Works tests cubes shall represent quality of concrete incorporated in the work and taken out in sets of 6 cubes. The concrete for preparation of one set of 6 cubes shall be taken from one batch of mixed concrete discharged from mixer. The cubes shall be moulded in accordance with Indian Standard Code of Practice.
- ii) A minimum of one set of 6 cubes shall be taken for every 20 cum or part thereof in case of beam, slabs & connected columns; one set for 5 cum or part thereof of concrete poured for columns and they shall be considered as representative for said quantity. This is an average figure, and may be increased to cater for special conditions at the discretion of the Procuring Entity/Architects at site.
- iii) The cubes shall be cured as per IS Code of Practice. The entire operation of casting, arranging and despatch of cubes to Laboratory will be carried out by the Contractor under the supervision of the Procuring Entity's Site Engineer/Architect. Out of 6 cubes, 3 cubes shall be tested at an age of 7 days and balance at an age of 28 days in an approved Laboratory d) The cubes shall be initialled, numbered, dated jointly by the contractor's representatives and the Site Engineer of Procuring Entity/Architects' representative with a piece of wire or nail so that an indentation of the initials is left on the cubes.
- iv) The contractor shall arrange to transport the cubes to the approved laboratory and arrange to have the test results forwarded (in duplicate) directly from the laboratory to the Procuring Entity/Architects. The contractor shall bear all expenses in connection with the preparation of test cubes, i.e. provision of moulds, cost of concrete, labour and transportation charges to the approved laboratory, laboratory testing charges etc. and his rates for concrete items should be quoted accordingly.
- v) A Register shall be maintained at site by the Contractor with the following details entered and initialled by the Contractor and the Site Engineer.
- Reference to specific structural members receiving the batch of concrete from which the cubes were cast.
 - Mark on cubes.
 - The mix of concrete.
 - Date and time of casting.
 - Slump
 - Crushing strengths as obtained at the end of 7 days for 3 cubes out of a set of 6 and at the end of 28 days for the other 3 cubes.
 - Laboratory in which tested and reference to test certificate.
 - Any other information directed by the Procuring Entity/Architects.
- vi) A record of the quality of concrete incorporated in the work that is represented by the quality of concrete of the set of cubes along with the description of the structural members where concrete has been deposited shall be mentioned.

4.4.5. VIBRATION OF CONCRETE :

- a) Water Cement Ratio The water cement ratio (by weight) for all vibrated concrete (except controlled concrete) shall generally conform to relevant I.S. provision and it shall not be varied unless otherwise directed. In respect of "Design Mix" the water cement ratio shall be as determined in the laboratory mix design suitable for vibrated concrete.
- b) Placing
Concrete shall be placed in layers not over 45 to 60 cm (18 to 24 inches) deep and each layer shall be vibrated into places by methods which will not permit the ingredients to separate.

Surfaces shall be smooth and free from voids caused by stone pockets, where necessary vibration shall be supplemented by hand spading to secure these results.

c) Number and size of vibrators

Vibrators shall be of sturdy construction, adequately powered. The vibration shall be sufficiently tense to cause the concrete to flow or settle readily into place and visibly affect the concrete over a radius of at least 450 mm (18") when used in concrete having slump of one inch. A sufficient number of vibrators (at least one vibrator for a rate of concreting of 1.5 cum. (50 cft) per hour shall be employed so that at the required rate of placement, vibration throughout the entire volume of each layer of concrete and complete compaction are secured.

d) Manipulation of Vibrators

Internal vibrators shall be kept constantly moving in the concrete and shall be applied at points uniformly placed not further apart than the radius over which the vibrator is visibly effective. The vibrator shall not be held in one location long enough to draw a pool of grout from surrounding concrete. The vibration shall be such that the concrete becomes uniformly plastic and there shall be at least 200 seconds of vibration per square metre (20 second of vibration per sq.ft.) of surface of each layers of concrete, computed on the basis of visibly affected radius and taking overlap into consideration.

4.4.6 Grade of Concrete

The concrete shall be of grades designated as M-15, M-20, M-25, M-30, M 35, M40 of cube crushing strengths as specified in I.S. Code 456 of latest edition.

i) Ordinary Concrete

Concrete made without preliminary tests but by adopting volumetric concrete mix, shall be called "ORDINARY CONCRETE" unless otherwise mentioned in the bill of quantities all concrete shall be Design Mix concrete and no Ordinary concrete shall be used.

ii) Nominal Volumetric Mixes

Strength Requirements of Concrete

Where ordinary Portland cement is used, the compressive strength requirements for various grades of concrete shall be as given in Table 2 of I.S. 456 of latest edition. It shall be the contractor's responsibility to obtain specified strengths for the various grades of concrete.

Where rapid hardening Portland cement is used, 28 days' compressive strength requirements specified shall be met at 7 days. d) Design Mix Concrete. Concrete made with preliminary tests by designing concrete mix in a laboratory shall be called "DESIGN MIX CONCRETE" and shall be designated as M-20, M- 25,M-30, M-35, M40 etc.

- a. Concrete Mix for Various Grades of Design Mix Concrete mixes shall be designed for various grades of concrete by the contractor to achieve the respective strength, durability and workability necessary for the job by the most economical use of various ingredients. The design should be made conforming to the relevant IS Specifications (IS-456, 516 of latest edition) in respect of proportioning of fine aggregate to coarse aggregate, maximum quantity of dry aggregates and water cement ratio, the minimum cement content as mentioned in the Schedule of Quantities. The contractor will arrange for the testing of various trial mixes of sufficient number (as per direction of the Architects/Procuring Entity) at his own cost in laboratory approved by the Architects/Procuring Entity for the preliminary test for different grades of concrete. The Architects/Procuring Entity will adopt the concrete mixes for the respective concrete grades from the test results of the said trial mixes, conducted and certified by the approved laboratory and the contractor will accordingly proceed with the concreting at work site. Constant check on grading and mix proportion shall be done by the contractor who will always be responsible to produce quality concrete of required grades as per the acceptance criteria of IS 456 of latest edition. If there is any change in the quality of

aggregates (both coarse and fine), necessary alteration to the mix proportion should further be approved by the Architect/Procuring Entity before the same are used at work site. The Architects will always have the unquestionable right to revise the minimum cement content as decided above, if in his opinion, there is any chance of deterioration of quality of aggregate or other reason.

4.4.6. WATERTIGHT CONCRETE :

Concrete in all underground works such as water tanks and the like where concrete of M25 and above grades is specified, will be considered as water-tight concrete even if not specifically mentioned in the Schedule of Quantities. Contractor has to ensure that there are no vertical joint in the concrete of tanks etc. Water stoppers shall be provided horizontally only where it is required between the lifts. In respect of such concrete it shall be contractor's responsibility to ensure that the resulting construction is watertight, failing which, the contractor shall carry out at his own cost, all necessary remedial measures as per direction of Procuring Entity/Architect.

4.4.7. SAMPLE SIZE AND ACCEPTANCE CRITERIA :

All tests shall be carried out in accordance with I.S 516 of latest edition. The Criteria for acceptance of a concrete of a specific grade shall be in accordance with recommendation of IS-456 of latest edition.

4.4.8. CEMENT CONCRETE MUDMAT

Concrete for the purpose shall be in the proportion of (1:3:6) 1 part of cement, 3 parts of sand and 6 parts of stone chips and 1:4:8 (1 cement, 4 parts of sands and 8 parts of stone chips/jhama khoa) may be mixed by volumetric batching as mentioned in the Schedule of Quantities.

4.4.9. WATERPROOF CONCRETE

Excepting internal R.C. columns and R.C. walls all structural concrete of basement slab and retaining walls, Ramp wall & slab, water tanks and underground tanks shall be cast with admixture of water proofing compound as advised by the specialist waterproof agency. The waterproofing compound for the purpose shall be of approved manufacturers and shall be mixed as per manufacturer's specification. The resulting concrete shall be perfectly waterproof. The work of waterproofing concrete by the admixture of waterproofing compound shall be done under direct supervision of a senior representative of the approved manufacturers. The Contractor shall give a guarantee for 10 years non judicial stamp paper of appropriate value as per the proforma enclosed against water leakages through the resulting concrete work and shall rectify all defects during the guarantee period without any extra charges. The waterproofing compound for this purpose shall be paid in a separate item if not otherwise mentioned in the Schedule of Quantities. Full payment against this item of work shall be made after testing & satisfactory result and submission of guarantee at an approved proforma.

5. FORM WORK

5.1.1. MATERIALS AND DESIGN

- b) The form work shall be of approved Mild steel plates and no timber planks etc shall be used.. Joints of the shuttering must not allow loss of liquid from concrete. If any particular material or materials be specified in the Schedule of Quantities for formwork such particularly specified material or materials shall be used in work. The form work shall be constructed as to remain sufficiently rigid during placing of the concrete. All shuttering and framing must be adequately stayed and braced to the satisfaction of the

Procuring Entity/Architects for properly supporting the concrete during the period of hardening. The forms shall have sufficient strength and rigidity to hold concrete and withstand the pressure of ramming and vibration without deflection from the prescribed lines and levels. The surface of all forms in contact with concrete shall be clean, rigid, watertight and smooth. Suitable devices shall be used to hold corners, adjacent ends and edges of panels of other forms together in accurate alignment.

- c) The form work shall conform to the shape, lines and dimensions to suit the R.C.C. members as shown on drawing. Form work shall be adequately designed to support the full weight of workers, fresh placed concrete without yielding to settlement or deflection and to ensure good and truly aligned concrete finish in accordance with the construction drawings. A camber in all direction of 6 mm for every 5 metre span in all slab and beam canting shall be given to allow for unavoidable sagging due to compression or other causes.
- d) The form work shall be so designed that the sides of the beams shall be first struck leaving the soffit of beams and supporting props in position. Props shall be designed to allow accurate adjustment & to permit of their being struck without jarring the concrete.
- e) Temporary openings shall be provided at the base of columns forms and at other points where necessary for facilities of cleaning and observations immediately before concrete is deposited.
- f) Vertical Shuttering
The vertical shuttering shall be carried down to such solid surface as is sufficiently strong to afford adequate support and shall remain in position until the newly constructed work is able to support itself. Props shall be securely braced against lateral deflection. Steel props of approved quality shall be used. In case timber props and bullies are allowed to use these shall be of minimum 10 cm diameter and shall be straight and adequately strong. Bamboo props shall not be used. The spacing of such struts shall be designed to carry loads imposed on it without undue deflection of the members supported by the props and shall be approved by the Procuring Entity/Architects. Any alterations suggested by them shall be carried out at Contractor's expenses. Bracing shall be provided as directed without extra cost. The contractor shall allow in his rates for providing props and struts for any height shown in the working drawings issued to the contractor from time to time.

5.1.2.WATER TIGHTNESS :

The Contractor shall ensure that the forms are checked for water tightness just before concreting operation starts and shall make good any deficiencies. If instructed by the Procuring Entity/Architects building paper or any other approved materials will have to be used without any extra charge for the same.

5.1.3.CLEANING AND TREATMENT OF FORMS

All rubbish, particularly wood chippings, shavings and saw dust, shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved composition. Care shall be taken that such approved composition is kept out of contact with the reinforcements. Interior of all moulds and boxes must be thoroughly washed out with hose pipe or otherwise so as to be perfectly cleaned and free from all extraneous matter before deposition of concrete. Prior approval of the form work should be taken from Architects before placing reinforcement on the form work.

5.1.4.STRIPPING

Form shall be left in place until their removal is authorised by the Procuring Entity/Architects and shall then be removed with care so as to avoid injury to concrete. Under no circumstances shall form be struck until the concrete reaches a strength of at least twice the stress to which

the concrete may be subjected at the time of striking. The strength referred to shall be that of concrete using the same cement and aggregate with the same proportion, and cured under conditions of temperature and moisture similar to these existing on the work. Where possible, the form work should be left longer as it would assist the curing.

5.1.5. STRIPPING TIME

In normal circumstances (generally where temperatures are above 20oC and where ordinary cement is used)forms shall be struck after expiry of the following periods unless otherwise directed at site by the Procuring Entity/ Architects.

Striking Time in days

Location	Ordinary Portland Cement	Pozzalana Cement
a) Vertical sides of walls slabs beams and columns	2	4
b) Bottom of slabs upto 4.5 M span	7	14
d) Bottom of slabs above 4.5 M span & Bottoms of beams upto 6.0 M span.	14	21
e) Bottoms of beams over 6 M span & arch rib bottoms above 6 M span	21	30

For rapid hardening cement, 3/7 of the above periods will be sufficient in all cases except vertical sides of walls, slabs, beams and columns which should be retained for a minimum period of 24 hours. minimum period of 24 hours.

5.1.6. FORMWORK IN LIFTS FOR CONTINUOUS SURFACE :

Where forms for continuous surface are placed in successive units, (as for example in columns or walls) the forms shall fit tightly over the completed surface so as to prevent leakage of mortar from the concrete and to maintain accurate alignment of the surface.

5.1.7. POROCEDURE WHILE REMOVING THE FORMWORK :

All formwork shall be removed without such shock or vibration as would damage the reinforced concrete. Before the soffit and struts are removed the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened. Proper precautions shall be taken to allow for the decrease in the rate of hardening that occurs with all cement in the cold weather.

5.1.8. FORMWORK FOR WAFFLE SLABS

Waffle Slabs shown in the Drawings have to be cast in One Single Pour including waffles and outer and intermediate beams. Contractor needs to ensure the supply of concrete during the casting of the slabs and a suitable program shall be provided by the Contractor for the Large Areas Concreting. If needed, chilled concrete may be used by contractor For waffle slabs area it should ensure that the Bottom and side finish of the Concrete remains smooth for the waffle slab.

5.2. DEFECTIVE OR POOR CONCRETE - PROCEDURE FOR DEALING WITH

5.2.1. GENERAL

If in the Procuring Entity's/Architects' opinion there is doubt as to the strength of the structure due to the works test cube failing to attain specified strength due to poor workmanship like honeycombing etc. or any reason attributable to negligence on the part of the contractor then the Procuring Entity's/Architect's decision regarding dismantling, of such concrete or rectification if concrete is allowed to be retained in its place shall be final and binding on the contractor.

5.2.2. WHERE CONCRETE IN STRUCTURE IS ALLOWED TO BE RETAINED

In the case of concrete showing the result of the tests strength less than those specified, the quantities in cubic metre certified by the Procuring Entity/Architects as so deficit may be allowed to remain in such a case subject to deduction for such sums as are or may become due under the contract. The Procuring Entity/Architect shall have full power in their absolute discretion to fix the actual rate of deduction.

5.2.3. CONCRETE ORDERED TO BE DISMANTLED

If the deficiency exceeds standard Deviations arrived as per IS 456 of latest edition, the Procuring Entity/Architects may at their discretion direct the portion of concrete certified by them so as deficient in strength to be dismantled from the structure and replaced by concrete of specified strength and the contractor shall in that case have to carry out that direction at his own cost irrespective of the amount of loss, inconvenience and difficulties involved. Concrete thus dismantled will not be measured and paid for.

5.2.4. HONEY COMBING

- a) Where honeycombed surface are noticed in the concrete, the contractor shall not patch up the same until examined by the Procuring Entity/Architects and decision given regarding the acceptance with rectification or rejection of the same. If the contractor patches up such defects without the knowledge of the Procuring Entity/Architects the Procuring Entity/Architects will be at liberty to order demolition of the concerned concrete members to the extent they consider necessary. In such case, the contractor at his expense, shall demolish and reconstruct defective work. The demolished work shall not be measured and paid for.
- b) If in the opinion of the Procuring Entity/Architects the honeycombing is harmful to the structure and where so directed by the Procuring Entity/Architect the full structural members affected by honey combing as decided by Procuring Entity/Architects shall be dismantled and reconstructed to Procuring Entity/Architects' approval at the contractor's expense. The demolished concrete will not be measured and paid for.
- c) Where in the opinion of the Procuring Entity/Architects the Structural members containing honeycombing can be allowed to be retained with rectification, the rectification shall be carried out as directed by the Procuring Entity/Architects by using Epoxy Adhesives for concrete.

5.2.5. LOAD TESTING

The Procuring Entity/Architects reserve the right to reject proposal of any load testing on structure and proceed to deal with defective concrete as stated in the paragraph. However, purely at their discretion, they may instruct the contractor to make a loading test on the work part thereof. The nature of the test and the loading shall be left to the discretion of the Procuring Entity/Architects. The contractor shall bear the cost of the test and the cost of dismantling and reconstruction or concreting the defects by rectification in accordance with their instructions. Where such structure is allowed to remain in the work the concrete shall be accepted as belonging to the next lower grade and payment shall be made accordingly to the contractor.

5.2.6. OTHER DEFECTS

Any other defects in concrete shall be made good as directed by the Procuring Entity/Architects at the contractors expenses.

5.2.7. CONTRACTOR'S RATES TO INCLUDE

The rates of the contractor for providing and laying cement concrete in various grades or proportion in the schedule of quantities shall, apart from any other factors specified elsewhere in the tender documents, include for the following :

- a) For all factors and method of work described in this specification and relevant Indian Standards.
- b) For all materials, labours, tools and plants, scaffolding, staging etc. mixing conveying and placing concrete in position, ramming, vibrating, trowelling, curing, and removing the scaffolding after the work is complete.
- c) Unless otherwise specified in the Schedule of Quantities the cost for concrete items shall include for providing, stays, struts, bolts, nuts and every item necessary to keep the forms rigid, smoothing the surface to receive concrete as per detailed drawing, striking and stripping formwork after the concrete is cured or as specified, hacking the concrete surfaces required to receive plaster etc. Where shuttering is described as a separate item in the schedule of quantities, rate for shuttering shall be inclusive of all the works mentioned in this para apart from other factors mentioned in specification for form work and also elsewhere in this contract. Shuttering to curve structure will be measured and paid as detailed in Schedule of Quantities.
- d) The reinforcement in case of reinforced concrete work will be paid for separately unless otherwise stated in the particular items, but rate shall include for pouring concrete and packing around reinforcement.
- e) The measurement of concrete will be as per detailed drawing, shapes and size based on net structural sizes as per drawing i.e. exclusive of plaster.
- f) Rates for concrete items shall cover for any shape of structural members like columns, beams, fascia, fins, louvers etc. and for cantilever beams, slabs, etc. including curve structures.
- g) Formation and treatment of construction joints, and expansion joints where water bars of approved materials or joint fillers like "Shalitex" are specified such materials shall be paid as per separate rates.
- h) Design of mixes, if required by specification, testing in an approved laboratory, tests of materials and work required in the opinion of the Architect and described in these specification.
- i) Fixing all inserts like pipe, plugs, forming holes etc as described.
- j) Weigh-batching using a Mechanical Weigh Batcher of a batching plant or where so specified for volumetric batching.
- k) For taking out dowel bars, fan hooks, etc. through shuttering.
- l) For forming drip moulds in chajja, sills etc. as shown in the drawings or as described.
- m) For work at all levels.
- n) In cases where at the junctions of beams, column and slab the composition of concrete mix of specified strength be different for columns, beams and slab then in such cases only the richer concrete among those specified for in all these members shall be used at the junctions and rate quoted for columns, beams and slabs or any members entering such junctions shall allow for the same. Rate shall also cover for spill over of rich concrete in beams to natural angle of repose of wet concrete required from practical consideration while concreting the junctions.

6. STEEL REINFORCEMENT

6.1.1. MILD STEEL BARS

Mild steel reinforcement bars shall conform to I.S. 226 of latest edition "Standard Quantity" or I.S. 432 of latest edition "Grade I". Other qualities of steel shall not be acceptable.

6.1.2. HIGH YIELD STRENGTH DEFORMED BARS

Where high strength deformed steel bars and wires are specified, the material shall be as manufactured by M/s. SAIL, M/s. Tata Iron & Steel Company Ltd or M/s. RINL conforming to IS 1786 of latest edition accompanied by a certificate from manufacturer. Test : Necessary tests on steel reinforcements bars & wires shall be carried out by the contractor for every lot of purchase at no extra cost.

6.1.3. CLEANING OF REINFORCEMENT

Before steel reinforcement is placed in position, the surface of the reinforcement shall be cleaned of rust, dust, grease and any other objectionable substances.

6.1.4. BAR BENDING SCHEDULE OF REINFORCEMENT

On receipt of structural drawing, Contractor shall prepare bar bending schedule of reinforcement and shall obtain approval of the Procuring Entity/Architects.

6.1.5. CUTTING OF REINFORCEMENT

Before steel reinforcement bars are cut, the contractor shall study the lengths of bars required as per drawing and shall carry out cutting only to suit the sizes required as per drawing.

6.1.6. PLACING AND SECURITY

Reinforcement bars shall be accurately placed and secured in position and firmly supported or wedged by precast concrete blocks of suitable thickness at sufficiently close intervals so that they will not sag between the supports or get displaced during the placing of concrete or any other operation of the work. Contractor shall maintain reinforcement in its correct position without displacement and correct specified cover. The contractor shall be responsible for all costs for rectification required in case the bars are displaced out of their correct position.

6.1.7.

BINDING WIRE

The reinforcement shall be securely bound wherever bars cross or whenever required for with 20 gauge soft black annealed steel wire.

6.1.8. WELDING

Welding of bars shall not be carried out unless specifically authorised in writing by Procuring Entity/Architects as per I.S. Code of Practice in place of splicing. However, no extra payment shall be allowed for the same.

6.1.9. BENDS ETC

Bends, cranks, etc. in steel reinforcement shall be carefully formed, care being taken to keep bends out of winding. Otherwise all rods shall be truly straight. If any bend shows signs of cracking the rod shall be removed immediately from the site. Minimum radius of 9 times diameter of the bar shall be used unless otherwise specified in the drawings. However, in respect of standard hooks the radius of bend shall be 2 times the diameter of bar. Heating of reinforcement of bars to facilitate bending will not be permitted. The bars shall always be bent cold. In case of mild steel reinforcement bars of larger sizes where cold bending is not possible they may be bent by heating with written permission of the Procuring Entity/Architects. Bars when bent shall not be heated beyond cherry red colour and after bending, shall be allowed to cool slowly without quenching. The bars damaged or weakened in any way in bending shall not be used on the work. High strength deformed bars shall in no case be heated to facilitate bending or cranking.

6.1.10. INSPECTION OF REINFORCEMENT

No concreting shall commence until the Procuring Entity/Architects have inspected the reinforcement in position and until their approval have been obtained. A notice of at least 72 hours shall be given to the Procuring Entity/Architects by the contractor for inspection of reinforcement. If in the opinion of the Procuring Entity/Architects any materials are not in accordance with the specification or the reinforcement is incorrectly spaced, bent or otherwise defective, the contractor shall immediately remove such materials from the site and replace with

new and rectify any other defects in accordance with the instruction of the Procuring Entity/Architects and to their entire satisfaction.

6.1.11. NETT MEASUREMENT

Reinforcements shall be placed as shown on the structural drawings and payment will be made on the nett measurements from drawings. Only such laps, dowels, chairs and pins in reinforcement as approved by the Procuring Entity/Architects or shown on drawings shall be paid for. The contractor shall allow in his quoted rates for all wastage which will not be paid separately.

6.1.12. STOCK PILING OF STEEL

Steel required shall be stock piled well in advance of need in the work. Contractor shall stock pile 1/3 requirement within 15 days, 2/3rd requirement at 1/4 contract time and full requirement at 1/2 contract time or to suit the accepted work programme.

6.1.13. COVER FOR REINFORCEMENT :

Cover shall be measured from the outer surface of main reinforcement. Cover shall be as follows if not specified/shown in construction drawings.

- a) At each end of a reinforcing bar, 25 mm or twice the diameter of such rod or bar, whichever is greater.
- b) For longitudinal reinforcing bar in beams 25 mm or the diameter of such rod or bar, whichever is greater.
- c) For tensile, compressive shear or other reinforcement in a slab 15 mm or the diameter of such reinforcement whichever is greater.
- d) For reinforcement in any other member such as a lintel, chajja, canopy or pardi, 15 mm or the diameters of such reinforcements, whichever is greater.
- e) For main reinforcement in isolated footings (side and bottom) clear cover shall be 50 mm.
- f) For column bars clear cover shall be 40 mm, unless other-wise specified as in drawing. In case of columns of minimum dimension of 200 mm or under, whose reinforcing bars do not exceed 12 mm, minimum cover of 25 mm should be provided.
- g) For bars in slabs of strip footings and mat foundations the clear cover shall be 50 mm. Beam bars shall be placed over slab bars in respect of beam & slab type foundations.

6.1.14. RATES QUOTED FOR REINFORCEMENT IN ADDITION TO ANY FACTORS MENTIONED ELSEWHERE SHALL ALSO INCLUDE FOR

- a) All cutting to length, labour in bending and cranking, forming hooked ends, handling, hoisting and everything necessary to fix reinforcement in work as per drawing.
- b) Decoiling, straightening (coiled bars, bent bars to facilitate transporting).
- c) Cost of binding work required as described.
- d) Cost of precast concrete cover blocks to maintain cover and holding reinforcement in position.
- e) For fabricating and fitting reinforcement in any structural member irrespective of its location, dimensions and level.
- f) Removal of rust and every other undesirable substances, using wire brush etc as described.
- g) Work at all levels.
- h) Rolling tolerance and wastage.
- i) Stock piling of reinforcements as described.

7 DAMP PROOF COURSE :

Damp proof course shall be 40 mm/25 mm thick (as specified in the Schedule of Quantities) stone 1:1 1/2:3 (1 part cement, 1/2 parts sand and 3 parts stone chips of 6 mm graded down Approved waterproofing compound of proportion as specified by manufacturer should be mixed with the concrete during mixing, as per manufacturer's specification. Before laying the concrete on the wall, the top surface shall be thoroughly cleaned of dirt, loose particles, make mortar dropping and

laitance, if any kind by scrubbing with coir or steel wire brush or by hacking if necessary. The surface shall be moistened before laying the concrete. The concrete should be laid in every case over the full width of the superstructure walls or as shown in the drawing. The top surface shall be finished with double chequered marks for adhesion of mortar for brick work. Proper curing should be done before starting the brick work over the damp proof course. If any particular materials or any other treatments be specified in the schedule of quantities for damp proof course such particular materials or specifications shall be followed.

8 BRICK WORKS :

8.1 BRICKS

- a) The bricks shall be locally available kiln burnt bricks of generally regular and uniform size, shape & colour, uniformly well burn but not over burnt. The bricks shall be free from cracks, chips, flaws, stones or lumps of any kind and the rating of efflorescence shall not be more than "moderate", when tested as per I.S. 3495 of latest edition. They shall not have any part unburnt. They shall not break even after being dropped on the ground on their flat face in a standard condition from a height of 60 cms.
- b) The size of brick shall normally 250 mm x 125 mm x 75 mm or 230 mm x 115 mm x 65 mm. Bricks of one standard size shall be used on one work unless specially permitted by the Procuring Entity/Architects.
- c) After immersion in water, absorption by weight shall not be exceed 20% of dry weight of the brick when tested according to IS 1077 of latest edition. Unless otherwise specified the load to crush the brick when tested according to IS 1077 of latest edition shall not be less than 75 Kg/Sq.cm.
- d) Prior approval of Procuring Entity/Architects shall be obtained for the brands of bricks to be used in the work after compliance with the above specifications/tests.

8.2 MORTAR

Unless otherwise specified, mortar for brick work shall be composed of 1 part of cement to 6 parts of approved sand for walls of one brick thick (25 cm) and over and one part of cement to 4 parts of approved sand for half brick thick and brick on edge walls. As per item in the schedule.

8.3 CONSTRUCTION DETAILS

- a) Soaking
All brick shall be immersed in water for 24 hours before being put into work so that they will be saturated and will not absorb water from the mortar.
- b) Bats
No bats or cut bricks shall be used in the work unless absolutely necessary around irregular openings or for adjusting the dimensions of different course and for closers, in which case, full bricks shall be laid at corners, the bats being placed on the middle of the courses.
- c) Laying
The bricks shall be laid in mortar to line, level and shapes shown on the plan, slightly pressed and thoroughly bedded in mortar and all joints shall be properly flushed and packed with mortar so that they will be completely filled with mortar and no hollows left any where. Bricks shall be handled carefully so as not to damage their edges. They should not also be thrown from any height to the ground but should be put down gently. All course shall be laid truly horizontal and all vertical joints made truly vertical. Vertical joints on one course and the next below should not come over one another and shall not normally be nearer than quarter of a brick length. For battered faces beading shall be at right angles to the face. Fixtures, plugs, frames etc. if any, shall be built in at place shown in the plans while laying the courses only and not later by removal of bricks already laid. The top layer of bricks of one or more thick wall coming in contact with R.C.C beam, slab and at window sill level etc shall be laid on edge as per direction. Care shall be taken during construction to see that edges of bricks at quoins, sills, heads etc.

are not damaged. The verticality of the walls and horizontality of the courses shall be checked very often with plumb bob and spirit level respectively. All external wall should have fair face on exterior surface.

d) Bond

Unless otherwise specified, brick work shall be done in English Bond. All walls, coming in contract with reinforced concrete columns, beams etc. should be properly bonded by inserting reinforcements. Extra labour shall be included in the rates (reinforcements will be measured and paid separately against reinforcement item provided in the Schedule of Quantities.

e) Joints

Joints shall not exceed 10 mm (about 3/8") in thickness and this thickness shall be uniform through out. The joints shall be raked out not less than 10mm (about 3/18") deep when the mortar is green where pointing is to be done. When the brick surface are to be plastered, the joints shall be raked to a depth of 5 mm when the mortar is green, so as to provide good key to plaster.

f) Uniform Raising

Brick work shall be carried up regularly in all cases where the nature of work will admit, not leaving any part 60 mm lower than another. But where building at different levels is necessary, the bricks shall be stepped so as to give later at uniform level and effective bond. Horizontal courses should be to line and level, and face plumb or to later as shown on the plan. The rate of laying masonry may be upto a height of 80 cm (about 32") per day if cement mortar is used, and 45 cm (about 18") if lime mortar is used.

8.4 SCAFFOLDING

The scaffolding must be of approved type strong and rigid stiffened with necessary cross bearers and safe to prevent injury to persons or materials. The contractor shall have to allow other trades to make reasonable use of his scaffolding as directed by the Procuring Entity/ Architects. If for the interest of work the contractor have to erect scaffolding in the other properties including local bodies or Corporation, the arrangement for the same including the cost of licensing fees etc. shall have to be borne by the contractor and the Procuring Entity should be kept free from any liability on this account. Put log holes shall be made good by bricks to match the face work when put logs are removed after ensuring that the holes behind are solidly filled in with 1:4:8 cement concrete.

8.5 CURING

All brick works shall be kept well watered for 14 days after laying. While pozzalana cement is used for mortar the curing shall be extended by one week at contractors expense.

8.6 EXPOSED BRICK WORK

Where exposed brick work is specified the usual specification for 'Brick Work' as mentioned above will be applicable for 'Exposed Brick Work', but in addition specially selected brick shall be used for facing, ensuring regular and clean faces of uniform colour. No bricks which are broken chipped, wrinkled or which have irregular edges or corners shall be used. Depending on the quality of bricks and if instructed by the Procuring Entity/Architects the exposed faces of every bricks shall be rubbed before laying without extra charge. Wooden fillets 10 mm thick and 10 mm wide shall be placed at the edge of joints so that the mortar comes on the surface of the bricks and a regular thickness of joints is maintained. The surface shall be rubbed down with brush on bricks if necessary, and thoroughly washed. No mortar shall be allowed to stick to the surface, which shall be left clean to the Procuring Entity's/Architect's satisfaction with all joints even and true to straight line. Double scaffolding shall be used for exposed brick work, if necessary.

8.7 HALF BRICK/BRICK ON EDGE WORK

Half brick thick and brick on edge walls, shall be provided H.B. wire netting of approved quality as reinforcements. For half brick thick wall and brick on edge wall H.B. wire netting reinforcements of approved quality shall be provided at every third course and in alternate course respectively according to standard practice.

8.8 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the rates for items of brick work shall include for the following :

- a) All labour, materials, use of tools, equipment and other items incidental to the satisfactory completion of brick masonry at all heights and levels.
- b) Erecting and removing of all scaffolding, ladders and plant required for the execution of the work to the height and depths and shapes as shown on the plan or as ordered by the Procuring Entity/Architects including extra labour and materials for using cut bricks in the construction of wall of varying thickness other than one brick, one and half brick, half brick and brick on edge walls as per drawings.
- c) Constructing brick work to lines, levels, batters, pillars, curve, projection, cutting, toothing etc. in strict conformity with the drawings and to any position or shape, to any heights or levels including raking out joints and housing frames, fixtures etc.
- d) Necessary charges of outside scaffolding work for construction of external brickwork from outside to have fair face on exterior surface.
- e) Curing brick work.
- f) Extra labour for bonding brick work to R.C. works as specified.
- g) Removing of all stains and adhering mortar lumps on the brick work surface.
- h) Cost of reinforcement in half brick walls and brick on edge walls.
- i) Raking out joints for receiving plaster as specified.

8.9 MEASUREMENTS :

- a) Half brick thick and brick on edge walls shall be measured in sq.m unless otherwise mentioned.
- b) One brick wall and thicker walls shall be measured in cum. Brick walls upto and including 3 brick in thickness should be measured in multiples of half bricks which shall be deemed to be inclusive of mortar joints. Widths of more than three bricks in walls will be measured actually and limited to the width specified.
- c) No deduction or addition shall be made on any account for :-
- j) Ends of dissimilar materials (i.e. joists, beams, lintels, posts, girders, rafters, purlins, trusses, corbels steps etc.) upto 0.1 sqm in section.
- d) For details of measurements not mentioned elsewhere in the contract, the method of measurement should be as per relevant I.S. Code.

8.10 BRICK FLAT SOLING

For soling the bricks shall be of approved, quality and sound, hard, tough, durable, dense, clean, free from soft spots, cracks decay and other defects. Brick bats shall not be used. All the fillings shall be watered and compacted to get maximum consolidation. All necessary trimming or filling for laying of the soling in line and required grade shall be done. The sub-grade shall be marked by stacks and strings for required depth for laying of soling. The cushioning will also consist of local sand. The bricks shall be laid on flat (unless otherwise specified) touching each other. Brick shall be laid in parallel rows breaking bond or in herring bone pattern as directed and firmly embedded true to line and filled with local sand. Measurement shall be in sqm.

9 FLOOR FINISHING WORKS

9.2.1 STONE FLOORING, DADO & SKIRTING

9.2.1.1 STONE FLOORING :

- a) Preparation of Subgrade

The surface of the structural slab shall be struck of reasonably true and at a level average 40 mm below the level of finished floor. All water, laitance or dirt on the surface of the structural slab shall be removed before the base course is laid. The slope required should be provided in the concrete of the structural slab to obtain uniform thickness of stone towards the predetermined positions of outlets.

b) Base Course

The mix for the base of the stone shall be part of portland cement, 2 parts of fine aggregate and 4 parts of coarse aggregate by volume. The stone chips for the base course should be 6 mm and down and should be properly screened and washed before use. Not more than 27.1/2 litres (5.1/2 gallons) of mixing water including the moisture in the aggregate shall be used for each bag of Portland cement in the mixture. The concrete shall be of the driest consistency possible to work with a sawing motion of the strike off board or straight edge. Changes in consistency shall be obtained by adjusting the proportions of aggregate and cement. In no case, shall be the specified amount of water exceeded.

c) Sectors

Stone flooring shall be laid in sections not exceeding 1.5 sqm with a maximum length of 1.5 M as directed. Flooring of the panels laying diagonally shall be completed first. The edges of the panels to be concreted shall be bounded by about 50 mm wide oiled wooden battens of the finished floor thickness. Immediately before the placing of the concrete the sub-base will be given a coat of neat cement grouting.

d) Top Layer :

After striking off the base course to the required slope, it shall be compacted with a wood flat. The surface shall be tested with a straight edge to direct high and low spots which shall be eliminated, before the concrete of the base course has hardened, the topping shall then be floated with a wooden float to render the surface even. After the surface is slightly hardened it shall be trowelled three times at intervals, so as to produce a uniform and hard surface. Excessive trowelling in the earlier stage shall be avoided. Trowelling of rich mix of dry cement and fine aggregate on to the surface shall not be permitted. The whole thing left undisturbed for 10 to 12 hours. After this period the whole floor should be left flooded with water for a minimum period of 14 days.

e) When working on alternate bay principle of the ponding of flooring should be deferred till the whole floor is complete. But the portions already completed should be occasionally damped with water by moist sand till the whole floor is complete. After this the whole floor will be flooded with water. For coloured finishes a suitable colour mixture shall be added to top cement finishing coat. The quality of colouring matter to be added to cement should be in the proportion of one part of pigment to three parts of Portland cement mixed thoroughly and screened before making to paste. The pigment shall be of approved manufacturer and tints shall be uniform. Any cracks, rust, disfiguration or discolouring of surfaces shall have to be made good without any extra charges to the satisfaction of the Procuring Entity/Architects.

f) Rates to Include :

Apart from other factors mentioned elsewhere in this contract the rate quoted for 'Stone flooring' shall include for the following :

4 All labour, materials and equipment, cleaning the sub-grade, laying base course and top layer to have finished 40 mm thick flooring as per above specifications.

ii) Curing

iii) Cleaning the floor from all stains etc.

Mode of Measurement : The measurement shall be square metre for the actual flooring provided.

9.2.2 STONE DADO AND SKIRTING :

The specification for materials and workmanship will be same as that of Stone flooring except that the finished thickness of dado and skirting will be 20 mm. The thickness of base course and top layer to be adjusted, accordingly to have a finished thickness of 20 mm after polishing. The rate

quoted for the same shall include for all the stages as mentioned in case of flooring except that the finished thickness will be 20 mm. Dado and skirting shall be measured in square metre. The measuring of skirting or dado shall be on the basis of wall length of area in contact with skirting & the dado respectively.

10 WOOD WORK AND JOINERY

10.2.1 TIMBER

- h) Unless otherwise specified, all timber for frames and shutters for doors, windows, ventilators, etc. shall be of approved quality with permissible defects for "First Grade" of timbers as per IS 1003 of latest edition. The planed surface shall be smooth and free from blemishes and discolourations.
- ii) All timber for carpentry and joinery in touch with masonry or concrete shall be creosoted before fixing.
- vii) All full fabricated timber shall be air seasoned at site of work for a period of not less than two months to allow for any shrinkage that may take place. The preparation of timber for joinery is to commence simultaneously with the beginning of the project work generally and should proceed continuously until all the wood work is prepared and fixed/stacked on or near the site as the case may be.

10.2.2 HOLDFASTS

Three holdfasts shall be fixed to each post of the door frame. The M.S. holdfasts shall be of the size as mentioned in the Schedule of Quantities and shall be fixed to the frames by means of screws and not nails. The other end of the holdfasts shall be fixed into jambs with 1:2:4 P.C.C. of dimensions as directed. Ends of holdfasts will be fish tailed. Whenever the frames are abutting to concrete surface approved metal expansion fastener as directed shall be provided for frame, hangers, rough grounds etc. The rates quoted for wood work and joinery shall exclude the cost for all types of holdfasts or other approved fasteners. The items of holdfast, metal fasteners etc. shall be paid as a separate item as described in Schedule of Quantities. The rate for holdfast shall include for cement grouting and fixing to frame work with screws etc. The rate for metal fasteners shall include for nuts etc. as required.

10.2.3 WORKMANSHIP AND CONSTRUCTIONS

- a. The workmanship shall be first class and to the approval of the Procuring Entity/Architects. Scantlings and board shall be accurately sawn and shall be of required width and thickness. All carpenter's work shall be wrought except where otherwise described. The workmanship and joinery shall be accurately set out in strict conformity according to the drawings and shall be framed together and securely fixed in approved manner and with properly made joints. All work is to be properly tenoned shouldered, wedged, pinned, braced etc. and properly glued with approved quality glue to the satisfaction of the Procuring Entity/Architect.
- b. Screws
Unless otherwise specified all screws to be used in woodwork and joinery shall be of cadmium plated and of approved quality. The size (diameter and length) should conform to those specified in hardware schedule.
- c. Tolerance
1.5 mm (1/16") will be allowed for each wrought face of sizes specified except where described as finished in which case they shall hold to the full dimensions.
- d. Protection
All edges of timber frames etc. shall be protected from being damaged during construction by providing rough timber casing securely fixed and other adequate protective measures.

- e. If it is decided by the Procuring Entity to provide anti termite treatment, the buildings contractor shall co-ordinate his work suitable as directed by the Procuring Entity/Architects.
- f. Door/Windows frames shall have cut rebate. Planted rebates shall not be permitted.

10.2.4 WOODEN FLUSH SHUTTERS : (Solid Core Type)

Solid core flush shutters shall be commercial or teak veneered type as specified in the item manufactured by approved manufacturer registered with ISI and shutter shall bear ISI mark. An approved sample shall be deposited in the office of the Procuring Entity/Architects at site for reference. The shutter will be provided with lipping. Finished thickness of the shutter shall be as mentioned in the item. Shutter should be hot pressed and phenol formaldehyde should be used as glue.

10.2.5 FACTORY MADE PANELLED SHUTTERS

Shutters shall be manufactured from Kiln Seasoned and chemically treated commercial hardwood of approved quality. Thickness and sizes of styles, rails etc shall be as specified in the Schedule of Quantities and or drawings. Panel shall be of phenol bonded plywood (BWP) conforming to I.S 303 of latest edition of thickness as specified in the Schedule of Quantities. Panel shall be in a single width piece. Shutters shall be manufactured conforming to the relevant I.S. specification and an approved sample shall be kept in the site office of the Procuring Entity/Architects for reference.

10.2.6 WOODEN HANDRAIL

Wooden handrail will be of specially selected Indian teak wood conforming to "First Grade" quality as mentioned in IS 1003 of latest edition fixed to concrete or metal balustrades with concealed screws and dowels. All bends, mitres, covers, moulds etc. will be strictly to proper shape and finely smoothed with sand papers. The handrail shall be finished with melamine polishing or painting as per direction of the Procuring Entity/Architects. The rate should include cost of polishing/painting and also the wastage of materials for the completed works.

10.2.7 HARDWARE FITTINGS

All hardware fittings for doors shall be either oxidised iron, brass, anodised aluminium as specified in the schedule of quantities. These hardware fittings shall be obtained from approved manufacturers and shall bear ISI mark wherever available. The samples for the fittings shall be submitted to the Procuring Entity/Architects for their approval. Hardware fittings for door shutters shall be paid as separate item as given in schedule of quantities. The rate for hardware fittings shall include for supplying, fitting and fixing the fittings with necessary cadmium plated screws, washers bolts, nuts etc. as required. All locks shall be provided with keys in duplicate and rate shall include for the same. Approved samples of hardware fittings shall be deposited with Procuring Entity/Architects for reference.

10.2.8 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract the rate for item of wood work and joinery shall include for the following :-

- i. Items of scantling :
- ii. All labour, materials and Equipments for fixing frame work as per drawing excluding the cost of holdfasts, Rawl plugs, or other fasteners etc.
- B. Items of shutters :
- iii. All labour, materials and Equipments for carrying out the work as per drawing.
- iv. Labour for fixing the shutters in position (excluding the cost of fittings) as per drawing.

10.2.9 MODE OF MEASUREMENT :

All measurements shall be as per relevant section of I.S. 1200 of latest edition. Scantling shall be measured in cum. The sectional area shall be the area of the least square, or rectangles from which the scantling may be cut. The length shall be actual length of timber required for the purposes including the extra portion required for jointing.

Shuttering shall be measured in square metre for closed door shutters area i.e. rebate to rebate without extra measurement for rebates and/or splayed meeting styles of door.

11 STEEL DOORS, WINDOWS AND VENTILATORS :

11.2.1 SPECIFICATION

Unless stated the Indian Standard Specification applicable for steel doors, windows and ventilators shall be IS : 1038 of latest edition "Specification for steel doors, windows and ventilators" and shall be manufactured from hot rolled steel sections conforming to I.S 7452 of latest edition.

11.2.2 OPENING

All the windows and ventilators shutters should open outside unless otherwise specified.

11.2.3 FABRICATION

Both the fixed and opening frames of the doors, windows and ventilators shall be formed by cutting section to required lengths, and mitres. The corners shall be electrically welded. Sash bars of the units shall be tenoned and riveted into the frames. Slots shall be cut in the fixed frames and the hinges shall be welded into a slot in the outer frame and other lead of the hinge riveted to the opening shutters.

11.2.4 HANDLES, PEGSTAYS

Each side hung shutter shall be provided with extended non-friction Hopes type hinges and pegstay arms 300 mm (12") long and shall have holes to keep the shutter open in three different position upto 90 degree (The peg and the arm for the pegstay shall be revetted). The handle shall be mounted on a handle plate and the plate shall be welded to the opening frame. The handle shall have two point nose which will engage with suitable tapered brass striking plate provided on the fixed frame to keep the shutter open in a slightly open position as well as in a fast position.

11.2.5 TOP/BOTTOM HUNG VENTILATORS

Top hung and bottom hung ventilators shall be provided with two plain hinges, with 300 mm (12") pegstay arms, which will keep the shutter open in three different positions and will act as a stopper too.

11.2.6 CENTRE-HUNG-VENTILATORS

Centre hung ventilators shall be made with two outer frames with mastic waterproof compound embedded between these two outer frames. They shall also be provided with a spring catch which when pulled by a cord. The upper half shall open inside and the lower half shall open out.

11.2.7 BEADING

Where metal beading is specified in the Drawing or elsewhere for fixing the glazing, the contractor should provide windows with threaded holes for fixing the beading with screws.

11.2.8 SAMPLES OF WINDOWS

A typical approved sample window should be kept in the office of the Procuring Entity/Architects at site until the satisfactory completion of the building. All windows and ventilators supplied and fixed at site should be of the same quality as of the approved sample; otherwise they shall be rejected. The decision of the Procuring Entity/Architects or their authorised representatives whether window or ventilator compared well with the approved sample shall be final and binding on the contractor.

11.2.9 PROCURING ENTITY/ARCHITECTS' APPROVAL

All windows and ventilators are subject to the approval of the Procuring Entity/Architects and they shall be strictly in accordance with the specification without any bends, etc.

11.2.10 AS PER DRAWINGS

All windows and ventilators shall be manufactured as per drawings supplied to the contractor.

11.2.11 FIXING TO BRICK WORK/CONCRETE

Steel windows and ventilators shall be fixed to brick work by means of standard M.S. lugs of size as mentioned in I.S. 1038 of latest edition and to concrete work by means of 125 mm long counter sunk screws with rawl plugs or other approved metal (brass) fastener after drilling into concrete with a power drill. Steel windows/ventilators etc shall be fixed as per manufacturer's recommendations or I.S. specifications. Holdfasts shall be grouted in concrete (1:2:4) mix of dimensions as directed. Quoted rates shall cover for all these factors.

11.2.12 STRUCTURAL SUFFICIENCY OF WINDOWS

All windows, doors, and ventilators shall be manufactured from a standard extruded sections of approved, appropriate sizes suitable for the particular type and size of the windows etc. Details shop drawings including the full design of every type of windows and ventilators shall be furnished in duplicate, for approval before undertaking the work. Contractor shall assume full responsibility regarding soundness of the windows, doors and ventilators and adequacy of the sections used for the particular sizes required to provide appropriate stiffness and strength. If in the opinion of the Procuring Entity/Architects deficiencies in the sections used are found, the contractor shall replace the windows, ventilators, etc. at his expenses by windows and ventilators etc. made from approved sections.

11.2.13 ALL TYPES OF WINDOWS

Rates quoted for steel windows and ventilators shall cover for all types of windows and ventilators whether of standard sizes or purpose made. Where composite continuous windows over long lengths (in plan) are required, rates shall cover for mullions, transoms at vertical or horizontal junctions of approved design, rates should also cover for partly fixed and partly openable type of continuous windows shutters of any type like side hung, centre hung, top hung, etc. as per detailed drawings.

11.2.14 GLAZING

Unless otherwise mentioned the whole of the glass shall be of required thickness as mentioned in the Schedule of Quantities float glass of selected quality and free from speck, valves, bubbles & other imperfections. The glazing shall be fixed with beads or bedded and packed and putting with putty suitable for use in tropical countries. Putty for glazing to wood work shall be best oil putty. In case of metal windows it shall be special gold size putty. The glass should be obtained from approved manufacturer. Prior to placement of order the sample for all glasses to be used will have to be approved by the Procuring Entity/Architects as regards their quality and tint etc. and the same should be kept in the office of the Procuring Entity/Architects. The quality of all

the glasses should used in the site should conform with the approved one in quality otherwise the Procuring Entity/Architects will be at liberty to reject the same for which no claim shall be entertained. On completion of the works the general building contractor shall clean and wash all the glass and leave the same perfectly clean and in tidy condition.

11.2.15 RATES TO COVER

Unless otherwise stated, contractors rate for steel windows, ventilators shall, apart from any other factors mentioned elsewhere in this contract, include for providing and fixing the following :-

- a) Window/Ventilator frames and shutters with hinges as described.
- b) M.S hold fasts or lugs as specified in I.S. 1038 of latest edition in the position and as per design of I.S. specification or where fixed to concrete 125 mm long countersunk screws with rawl plugs or other approved fasteners.
- c) Rolled Steel Mullions.
- d) Transoms with projected weather bars for side hung shuttering and plain ones for fixed windows.
- e) Aluminium beading with screws.
- f) Bolts, nuts, screws.
- g) Manganese brass spring catches.
- h) Chords for centre hung windows.
- i) Grouting of holdfasts in 1:2:4 concrete

11.2.16 MEASUREMENT

Measurement shall be in square metre.

12 CEMENT PLASTER (INTERNAL & EXTERNAL)

- a) Preparation of Surface
The walls to be plastered to have all joints raked out to a depth of 10 mm, if not already done. R.C.C surface shall be properly hacked to get good key to the plaster. All dust and oily matter, if any, shall be brushed and cleaned and surface to be plastered shall be kept wet for 6 hours before plastering is commenced.
- b) Proportion of Mortar :
The plaster in walls, lintels, columns, ceiling, ceiling beams, projected slabs, rails, chajja, marquise, domes etc. shall be done with sand cement mortar in the proportion as described in the Schedule of Quantities). No more cement mortar shall be prepared than that can be used within half an hours.
- c) Application of Plaster :
The mortar shall be applied evenly with force on the surface to be plastered. The mortar surface shall be finished at once by being rubbed over with a trowel till the cement appears on the surface. All corners, angles and junctions shall be truly vertical and horizontal as the case may be, carefully and neatly finished. Rounding of corners and junctions where required shall be done without extra charge. The mortar shall adhere to the surface intimately when set and there should be no hollow sound when struck.
- d) When neat cement finish is specified over the plaster surface, a coat of pure portland cement slurry, 1.5 mm thick shall be applied and well rubbed to the plaster surface while the plaster surface is still fresh.
- e) When no finish is specified, the plastered surface shall be rubbed well to an even plane with a wooden float for external surface and finished smooth with a steel trowel for internal surface.
- f) Rates to include

Apart from other factors mentioned elsewhere in the contract rates for the item of plaster shall include for the following :-

- g) Erecting, dismantling and removing the scaffolding.
- ii) Preparing the surface to receive the plaster.
- i) Providing cement plaster of the specified average thickness.
- ii) All labour, materials, use of tools and equipment to complete the plastering as per specification.
- iii) Curing for 7 days
- iv) Any moulding work if shown on the drawings or as specified unless separately provided in the tender.
- v) Labour for plastering the surface in two operations when thickness of plaster is more than 12 mm thick.
- vi) Plaster work in bends, arises, rounded angles, fair edges, narrow returns, quiriks 'V' joints, splays, drip mouldings, making good to metal frame junctions with skirting of dados narrow width and small quantities, making good round pipes, conduits, timbers, sills, brackets, railings, etc and making good after all the sub-contractors or nominated sub-contractors have done their work.
- vi) Neat cement finish when specified in the item.
- h) Mode of Measurement
Plaster shall be measured in square metre.

Walls : The measurement of wall plastering shall be taken between the walls or partitions (the dimensions before plastering shall be taken) for the length and from the top of floor or skirting depending upon the situation to the ceiling for the height.

Deductions : For jambs soffits, sills, etc. for openings not exceeding 0.5 sq.m each in area, ends of joists, beams, posts, girders, steps etc. not exceeding 0.5 sqm each in area, and opening not exceeding 3 sqm each, deductions and additions shall be made in the following manners :-

- i. No deductions shall be made for ends of joists, beams, posts, etc. and openings not exceeding 0.5 sqm and no additions shall be made for reveals, jambs, soffits sills etc. of these openings nor for finishing the plaster around ends of joists, beams, posts, etc.
- ii. Deductions for openings exceeding 0.5 sqm but not exceeding three sqm each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings :-
 - i) When both faces of wall are plastered with the same type of plaster, deduction shall be made for one face only.
 - ii) When two faces of wall are plastered with different type of plasters or if one face is plastered and other pointed, deductions shall be made in the plaster or pointing on the side on which the width of reveals is less than that on the other side but no deduction shall be made from plaster or pointing on the other side. Where widths of reveals on both faces of wall are equal, deduction of 50 per cent of area of opening on each face shall be made from areas of plastering and/or pointing as the case may be.
 - iii) When width of door frame is equal to thickness of wall or is projecting beyond thickness of wall, full deduction for opening shall be made from each plastered/pointed face of the wall.
 - j) In case of openings of area above 3 sqm each deductions shall be made for the openings but jambs, soffits and sills shall be measured. Ceiling
 - k) Ceiling shall be measured between the walls or partitions and the dimensions before plastering shall be taken.
 - ii) Ceiling with projected beams shall be measured over beam and the plastered sides of beams shall be measured and added to plastering on ceilings.

13 WHITE WASHING

I) White Washing

- a. **Materials** : White wash shall be prepared from 5 parts of stone lime and 1 part of shell lime. The lime shall be dissolved in tub with sufficient quantity of water (about 4/5 litres/kg of lime) and the whole thoroughly mixed and stirred until it attains the consistency of thin cream. The wash shall be taken out in small quantities and screened through a clean coarse cloth. Clean gum dissolved in hot water shall then be added in suitable proportion of 4 Kg of gum arabic per cum of lime to prevent the white wash coming off easily when rubbed. Indigo as necessary (upto 3 gm per kg of lime) shall be mixed as per standard practice.
- b. **Scaffolding** : This shall be double or single according to requirements and as directed. If ladders are used, pieces of old gunny bags or cloth rags shall be tied on their tops to avoid damage or scratches to the plastered surfaces, etc. Proper stage scaffolding shall be erected when white washing the ceilings.
- c. **Preparation of Surface** : The surface shall be prepared by removing all mortar droppings and foreign matter and thoroughly cleaned with hair or fibre brush or other means as may be ordered by the Procuring Entity/Architects to produce an approved clean and even surface. All loose pieces and scales shall be scrapped off and holes, cracks etc stopped with mortar to match with the surrounding finish. The mortar should be cured sufficiently.
- d. **Application of White Wash** : On the surface so prepared the white wash shall be laid on with a brush. The first stroke of the brush shall be from top downwards, another from bottom upwards over the first stroke, and similarly one stroke from the right and another from the left over the first brush before it dries. This will form one coat, each coat must be allowed to dry and shall be subject to inspection and approval before the next coat is applied. When dry, the surface shall show no signs of cracking. It shall present a smooth and uniform finish free from brush marks and it should not come off easily when rubbed with a finger. Minimum 3 coats of white wash shall be applied. No portions in the surface shall be left out initially to be patched up later on. For new work, the white washed surface shall present a smooth and uniform finish. Doors, windows floors and other articles of furniture etc. shall be protected from being splashed upon. Splashing and droppings, if any, shall be removed and the surfaces cleaned.
- e. **Rates to Include** : Apart from other factors mentioned elsewhere in this contract, the rates for white wash include for the following :-
 - i) All labour, materials, equipment required for white washing.
 - ii) Scaffolding including erection and removal.
 - iii) Providing and preparing the white wash.
 - iv) Preparing the surface for white wash including the scaffolding.
 - v) Applying the white wash in three coats minimum. If a proper even surface is not obtained to the satisfaction of the Procuring Entity/ Architects in 3 coats, contractors shall carry out additional coats of white wash to approval, at contractor's expense.
- f. **Mode of measurement** : The measurement shall be in square metre. The mode of measurement shall be as applicable to that for plaster.

14 CEMENT BASED PAINTING :

- i) **Material**

External waterproofing cement based paints shall be of approved quality and shall be manufactured by approved manufacturers.
- ii) **Preparation of surface**

Before painting is commenced on surface, all dirt, oil, grease, efflorescence and organic material shall be completely removed. The surface shall be wetted by sprinkling of water with fine spray. The surface shall be sprayed several times with a few minutes intervals between each spraying to allow the moisture to soak into the surface.
- iii) **Application**

Cement based paint solution shall be applied to the surface with hair brush to get uniform finish. After the first coat of paint has dried it shall be cured with water at least for 24 hours, before the application of the second coat should be elapsed between the two coats. The meaning of one coat shall be as described for white washing.

iv) Curing

Cement based paint work shall be kept damp at least for 7 days.

v) Rates to include

Apart from other factors mentioned elsewhere in this contract, the rate of providing cement paint shall include for the following :-

- a. All labour, materials and equipment to provide cement paint.
- b. Scaffolding, including erecting and removing.
- c. Preparing the surface as stated above.
- d. Applying 2 coats of approved cement based paint. If a proper and even surface is not obtained to the satisfaction of the Procuring Entity/Architects in the coats applied, the contractor shall provide additional coats of painting to approval, at contractor's expense.
- e. Curing as stated above.

vi) Mode of Measurement :

vii) Measurement shall be in square metre and as applicable to white wash. Nothing extra shall be allowed for painting on rough surface, for example, external sand faced plaster, rough cast plaster etc.

15 PAINTING, FRENCH POLISHING

15.2.1 PAINTING :

a) Material

Ready mixed oil paints and primer, in general shall be of approved quality, colour and shall manufactured by ICI, Berger Paints (India) Ltd, Asian Paints Ltd. These materials shall be in sealed tins and shall be opened in the presence of the Procuring Entity/Architects at site.

b) Preparation of Surface

1. Iron and Steel works :

Surface to be painted shall be thoroughly cleaned, sand papered and/or rubbed with emery cloth, if necessary, to remove grease, mortar or any other foreign materials. In case of rusted surface, it shall be first cleaned with wire brushes till the corroded rust is removed. the prepared surface shall be shiny and free from brush marks, patches, blisters and other irregularities. The surface thus finished shall be got approved for painting.

2. Wood work :

All surface to be painted shall be thoroughly cleaned sand papered and removed of all foreign materials. In case of surfaces having knot and nail holes, this shall be filled with knotting and stopping materials. The knotting materials shall consist of pure shellac dissolved in methylated spirit. Stopping materials shall consist of putty. The surface thus treated shall be allowed to dry and then sand papered smooth.

c) Application

After preparing the surface, a primer coat shall be applied. The primer coat shall be ready mix of approved make and manufacturer. After the primer coat is applied and perfectly dried, all holes, cracks, etc. which shall remain, shall be filled in with putty and the surface sand papered smooth. Then a second coat of paint of approved shade and manufacturers shall be evenly applied and allowed to dry. The third coat shall be carefully applied to achieve smooth and even surface after the previous coat has dried up. Minimum 3 coats of paint shall be applied inclusive of a primer coat. If a proper and even surface is not obtained to the satisfaction of the Procuring Entity/Architects in 3

coats, contractor shall carry out additional coats of painting to approval, at contractor's expenses. Care shall be taken that dust or other foreign materials do not settle or otherwise disfigure the various coats.

d) Rates to include :

Apart from other factors mentioned elsewhere in this contract, the rate for the item of painting shall include for the following :-

- i. All labour, materials equipment necessary to carry out the work.
- ii. Supplying the approved paint for priming and finishing coats.
- iii. Preparing the surface including knotting and stopping for receiving the priming and finishing coats.
- iv. Scaffolding including its erection and dismantling.
- v. Application of at least one primer coat and two coats of finishing for wood work and at least two finishing coats for steel work unless otherwise specified. If a proper and even surface is not obtained to the satisfaction of the Procuring Entity/Architects, contractor shall carryout additional coats of painting to approval at contractor's expense.
- vi. Protection to painted surface till dried and handed over.

15.2.2 Mode of Measurement

Painting to wood work and steel shall be measured separately, as per I.S. 1200 (Part XV) of latest edition.

16 WATER PROOFING TREATMENT TO ROOFS

- 16.2.1 CEMENT BASED WATERPROOFING TREATMENT WITH BRICK BAT COBA: In general the waterproofing shall be carried out as per specification of the specialist but duly approved by the Engineer. The roof surface before waterproofing shall be cleaned thoroughly and watered and shall be kept wet at least 12 hours prior to carrying out of waterproofing. If any leakage is observed the source of leakage shall be located and it shall be treated either by injection grouting or by closing of the crack with application of cement mortar 1:2 after cutting a V shape groove. The treatment shall be continued till the leakage is stopped. Brick piece of quarter half, and three quarter size are laid piece by piece in the form of horizontal brick masonry in waterproof mortar with waterproofing compound made up of cement and sand (1:5) and waterproof powder. The treatment is carried out layer by layer to make up the desired thickness to achieve the desired slope as specified in the drawing and as directed. The brick bat coba is finally covered with jointless waterproofing plaster with waterproofing compound finished smooth with trowel in cement colour, with false markings of 300mm squares. The treatment is carried along the vertical surface of the parapets and other adjoining walls, upto a height of minimum 300mm in the shape of round wata. The average thickness of treatment is about 125mm the minimum thickness at rain water outlet points being 75mm a slope of 1 in 120 or as specified in the drawing. The surface provided shall be hard and tough suitable for all normal commercial and domestic purposes. If however, it is desired to cover treatment with decorative tiles, marbles etc. then the surface of treatment shall be finished suitable to receive them. Due to the location of rain water pipes being far apart and due to the span being wider than 9 metres and the water is required to travel on one side only, then the thickness of the treatment increased proportionately to maintain the gradient for the easy flow of rain water and no additional payment will be paid on this account. Necessary grooves shall be provided in the walls to terminate the waterproofing treatment.

At the junction of the wall and the floor a round or triangular fillet of size 200mm x 200mm shall be provided. The entire surface shall be cured for minimum 14 days by storing water to a depth of at least 150mm in the entire area. During the period if any leakage is observed the same shall be rectified.

- 16.2.2 **MODE OF MEASUREMENT** Waterproofing of the terrace will be paid as per plan area only, measured wall to wall faces before application of treatment. The rounded wata and vertical faces will not be paid separately.

16.2.3 Guarantee

10 (Ten) years guarantee shall be provided on non-judicial stamp paper of Rs. 100.00 only at the approved proforma enclosed with the tender, duly signed by the Main Contractor and the specialized firm who execute the work. In the unlikely event of treatment becoming necessary subsequently during the guarantee period, required inspection and treatment shall be carried out free of cost by the contractor.

17 Waterproofing Tanks

17.1 Water Proofing of Horizontal Internal Surfaces of Under-ground Structure

i) **Preparation of Surface** The Water Proofing Treatment over the lean concrete/levelling course surface should adhere to the surface firmly, the surface of levelling course should be roughened properly when the concrete is still green. In case the surface is not made rough before the concrete is set, the work of water proofing should not be executed till proper key is provided for the base layer of Cement Mortar 1:3.

ii) **Blending Cement/Water with Water Proofing Compound** The required quantity of cement bags to be used for a particular portion of work should be emptied on a dry platform. Water proofing compound bearing ISI mark and conforming to IS 2645 should then be mixed properly with the cement. The quantity of water proofing compound to be mixed should be as prescribed by the manufacturer but not exceeding 3% by weight of cement. The quantity of cement and water proofing compound thus mixed should be thoroughly blended and the blended cement should again be packed in bags. For the water proofing compound in liquid form, the blending is to be done with water. This can be done by taking the just required quantity of water to be mixed in the particular batch of dry cement mortar. The required quantity of water thus collected per batch of dry cement mortar to be prepared should be mixed with liquid water proofing compound from sealed tins with ISI mark. The water thus mixed with water proofing compound shall be thoroughly stirred so that the water is blended with water proofing compound properly.

iii) **Rough Kota Stone 22 to 25 mm Thick** The stone slabs to be used for this item shall be in thickness of 22 mm to 25 mm. Larger size of stone slabs i.e. 550 mm x 550 mm or 550 mm x 850 mm shall be used to minimise the number of joints. General requirement of Kota stone shall be as laid down in CPWD Specifications of Kota Stone flooring.

iv) **Preparation of Cement Slurry** Cement slurry shall be prepared by using 2.2 kg of blended cement per sqm. area. Each time only that much quantity shall be prepared which can be covered on the surface and the surface in turn would be covered with 25 mm thick cement mortar base within half an hour. Slurry prepared and remained unused for more than half an hour shall be totally rejected.

v) **Preparation of Cement Mortar** Cement mortar 1:3 (1 blended cement: 3 coarse sand) shall be prepared with cement/ water duly blended as explained in clause 22.1.1 (ii). Only that much quantity of cement mortar which can be consumed within half an hour, shall be prepared. Any

cement mortar that is prepared and remains unused for more than half an hour shall not be used in the work and shall be rejected.

vi) Laying Water Proofing Course

- e) Before laying the base course of cement mortar 1:3, the lean concrete surface shall be cleaned neatly with water. Cement slurry shall be applied only on the area of the concrete surface that can be covered with the cement mortar (1:3) base course within half an hour. The cement slurry should cover every spot of the surface and no place shall remain uncovered. Just after the application of cement slurry on the surface, the cement mortar prepared should be used for laying the base course. Base Course should be laid to a perfect level with wooden/aluminium straight edge of at least 2 mtrs. long. The top surface of cement mortar should be finished neatly and later scratched when green with a suitable instrument before the base course dries and gets hard that is just before the base course takes up initial set.
- f) When the 25 mm thick base course is just getting set the cement slurry should be spread over the base course up to the area that shall be covered with just two to three stone slabs. The cement slurry shall be spread in such a way that the area of base course to be covered immediately shall be covered with slurry without any gap or dry spots. Immediately on applying cement slurry on the base course the Rough Kota Stone slab shall be laid over the base course and pressed gently so that the air gap can be removed. The slurry applied on the surface which gets spread when the stone slab is pressed shall get accumulated in the joints of adjacent stone slabs and if any gap still remains between the stone slabs the same should also be filled with additional quantity of cement slurry. For laying the stone slabs in perfect level, two stone slabs at adjacent concerns/ends shall be fixed firmly to the required level and a string stretched over the two slabs, the intermediate slabs shall then be set to the level of the string.
- g) After filling all the joints of the Rough Kota stone Slabs with cement slurry the area of stone slab shall be laid with cement mortar 1:3. The surface of stone slabs shall be cleaned and lightly watered. Cement mortar 1: 3 prepared shall be used for laying this course. For laying this course 25 mm high wooden strips shall be used and the top surface shall be finished smooth without using additional cement or slurry.
- h) After laying 3rd course and before the mortar layer takes the initial set, Stone aggregate of 10 mm to 12 mm nominal size shall be uniformly spread and lightly pressed into the finished surface @ 8 cudm./sqm. The aggregates shall not be embedded totally inside the mortar and shall be visible on the top surface.
- i) In cases where slope is to be provided for the water proofing layer, grading with additional cement concrete/cement mortar shall be provided and then the water proofing layer shall be laid on the graded surface. Extra payment shall however be made for the grading course.

vii) Curing Immediately after completing the fourth layer, arrangements shall be made for the top RCC slab as quickly as possible and in the meantime till the top slab is casted the water proofing treatment shall be kept wet continuously. In case the concreting of slab gets delayed for more than 2 weeks the curing can be stopped after 14 days.

viii) Measurement

Length and breadth shall be measured along the finished surface correct to a cm and the area shall be worked out to nearest 0.01 sqm.

ix) Rate

The rate shall include the cost of all labour & materials involved in all the operations described above. The cost of grading with cement concrete / cement mortar shall be paid for separately.

17.1 Water Proofing of Internal Horizontal Surfaces of Under-ground Structure

17.1.1 Same as in 22.1.1 above except that water proofing courses will be laid on R.C.C. Slab.

17.2 INTEGRAL CEMENT BASED WATER PROOFING TREATMENT ON THE VERTICAL SURFACE OF UNDER GROUND STRUCTURES

17.2.1 **Preparing the Surface** The surface of the structure to be treated shall be roughed either by raking of joints in case of brick/ stone masonry or by hacking the cement concrete surface with a specifically made hacking tool just after removing shuttering. Alternately, the surface should be roughened by providing spatter dash. While doing water proofing to vertical faces from inside, it shall be ensured that water proofing treatment of floor slab is not damaged. Preferably, water proofing of vertical surface shall be done before that of horizontal surface.

- 17.2.2 **Blending Cement/Water with Water Proofing Compound** Same as under clause for Horizontal surfaces.
- 17.2.3 **Rough Kota Stone Slab** Same as under clause for Horizontal surfaces.
- 17.2.4 **Preparation of Cement Slurry** Same as under clause for Horizontal surfaces.
- 17.2.5 **Preparation of Cement Mortar** Same as under clause for Horizontal surfaces.
- 17.2.6 **Laying Water Proofing Course** Same as under clause for Horizontal surfaces.. Further rough kota stone are not sufficiently rough to remain in vertical position held by cement slurry. Therefore, the grip for the stone slab has to be increased and this can be done by planting 12 mm to 15 mm nominal size stone aggregate fixed with araldite on surface of each sand stone slab.
- 17.2.7 **Curing** Same as under clause for Horizontal surfaces. Further till the water proofing work on vertical face is in progress, the water proofing work done on floor slab shall be kept wet for a minimum period of 14 days. Immediately after completion of water proofing on vertical faces of side walls, the water tank shall be gradually filled with water for testing.
- 17.2.8 **Measurement** Same as under clause for Horizontal surfaces
- 17.2.9 **Rate** Same as under clause for Horizontal surfaces.

18 PROVIDING WATER STOPS

18.1 Water stops conforming to IS 12200 for construction/expansion joints should be fabrication from a plastic compound, the basic resin of which shall be polyvinyl chloride. The compound shall contain additional resin/ plasticizer inhibitors or other materials such that when the materials is compounded it shall meet the requirement given in IS 15058.

18.2 Type of Joints for which Water Bars are Provided The water bars are provided only for the movement of joints in a water retaining structure. Different types of movement joints are as described below;

18.2.1 Complete Contraction Joint: This is a movement joint with deliberate discontinuity both in concrete as well as the reinforcement but no initial gap is maintained between the concrete on either side of the joint. This joint is intended to accommodate the contraction of the concrete.

18.2.2 Partial Contraction Joint: This is a movement joint with deliberate discontinuity in concrete but no water bar is provided and no discontinuity is provided in steel. No initial gap is maintained between the concrete on either side of joint.

18.2.3 Expansion Joint: This is also a movement joint with complete discontinuity in both reinforcement and concrete. It is intended to accommodate either expansion or contraction of the structure. In general such joint requires the provision of an initial gap between the adjoining parts of the structure which accommodates expansion or contraction of the structure.

18.3 Types and Performance of Water Bars Water bars are performed strips of impermeable material which are embedded in the concrete during construction so as to span across the joints and provide a permanent water tight seal during the whole range of joint movement. The most usual form of water bars are strip with a longitudinal corrugation. Another form of water bar of metallic type is Z shaped strip. Water bars of copper, sheet lead, natural or synthetic rubber and plastic such as polyvinyl chloride (PVC) are also used. These bars comprise of central longitudinal hollow tube with thin walls and stiff wings of about 150 mm width. Out of the metals available copper is most suitable as regards ductility, resistance to corrosion in air, water and concrete. However, it may be attacked by some wastes. If sheet lead is used it should be insulated from concrete by a good coat of bituminous or suitable composition. Natural synthetic rubber and plastics have very considerable advantage in handling, splicing and in making intersections. Galvanized iron sheets may also be used with the specific permission of the Engineer-in-charge provided the liquid stored or the atmosphere around the liquid retaining structure is not excessively corrosive i.e. sewage. The strip water bars described as above, while placing in position has to be passed through the

end shutter of the first placed concrete with the result the shuttering at this point should be perfectly water tight otherwise cement slurry may escape from the concrete being laid and will ultimately weaken the structure. Therefore to avoid the above problem one can prefer moulded type of water bar. The design of the moulded water bar with several projections need to be passed through the end shutter while placing the same in position. Another main advantage of this water bar is that since it occupies bigger proportion of the thickness of the joint it would lengthen the shortest alternative water path through the concrete.

18.4 It is important to ensure proper compaction of concrete around the water bar. Proper cover to all the reinforcement shall be maintained. Sometimes to increase the bond the holes are provided in the copper water bars but in the long run it proves to be disadvantageous as it shortens the path of water through concrete. Water bars should be placed at the centre of the wall or if it is to be provided away from the centre its distance from either face of the wall shall not be less than half of the width of water bar or as specified/directed by the Engineer-in-charge.

18.5 Covers Plates for Joint Sometimes joint cover plates have to be used for expansion joints mainly to avoid the risk of a fault in the water bar which is embedded. The plates to be used should be either copper or sheet lead. In case the copper plates are to be used, it should be clamped to the concrete face on each side of the joint. To ensure water tightness suitable gasket shall be used. Joint cover plates of sheet lead are also used and fixed on the joints. In this case the edges may return into grooves formed in the concrete and can be made completely water tight by lead caulking. Faces of the concrete to which sheet lead is to be fixed should be painted with bituminous or other suitable composition and the lead sheet should be similarly coated before fixing.

18.6 Spacing of Joints In Reinforced Concrete floors movement joints should be spaced at not more than 7.5 m apart in two directions at right angles. The wall and floor joints should occur at the base of the wall in which case corresponding vertical joint is not important. In concrete walls, the vertical movement joints should normally be placed at a maximum spacing of 0.75 m in reinforced walls. The maximum length desirable between vertical movement joints will depend upon the tensile strength of the walls and may be increased by suitable reinforcements. Amongst the movement joints in floors and walls as mentioned above, expansion joint should be normally be provided at spacing of not more than 30 m between successive expansion joints or between the end of the structure and the next expansion joint, all other joints being of the contraction type. CPWD SPECIFICATIONS 2009 994 In case of expansion joints the filling of these with bitumen filler, bitumen felt or any such material etc. shall be paid for separately in running metre. The measurement shall be taken upto two places of decimal stating the depth and width of joint. In case joint cover plates either of copper or sheet lead with ancillaries are provided, these shall be measured and paid for separately.

18.7 Measurement Length shall be measured correct to a cm and net quantities shall be calculated upto two places of decimal. Each category of water stops/bar such as PVC, copper specifying width, thickness shall be measured and paid for separately.

18.8 Rate The rate shall include all labour and materials in all the operations described above.

19 .M.S./ Cast Iron GRILLS, RAILING & GATES :

M.S. / Cast iron grills, railings and gates shall be fabricated and fixed in position strictly as per design and drawings. All intersections or meetings of all members shall be welded and the workmanship shall be high grade quality to the entire satisfaction of the Procuring Entity/Architects. After fixing in position, these shall be cleaned off dust, dirt, rust or scales and

rubbed with emery and an anticorrosive priming coat with yellow zinc chromate shall be applied. The rate for M.S. grills to window shall also include the cost of wood screws to be used for fixing, for M.S. railing the cost of 1:2:4 cement concrete for jamming the hold fasts of the railing. The rate is for the complete work in all respects.

20 HORTICULTURE AND LAND SCAPING

20.1 **HORTICULTURE WORK** Horticultural operations shall be started on ground previously levelled and dressed to required formation levels and slopes. In case where unsuitable soil is met with, it shall be either removed or, replaced or it shall be covered over to a thickness decided by the Engineer-in-charge with good earth. In the course of excavation or trenching during horticultural operations, any walls, foundations, etc. met with shall not be dismantled without pre-measurement and prior to the written permission of the Engineer-in-charge.

20.2 TRENCHING IN ORDINARY SOIL

20.2.1 Trenching is done in order to loosen the soil, turn over the top layer containing weeds etc. and to bring up the lower layer of good earth to form a proper medium for grassing, regrassing, hedging and shrubbery. Trenching shall be done to the depth ordered by the Engineer-in-charge. The depth is generally 30 cm for grassing and 60 cm for regrassing in good soil.

20.2.2 The trenched ground shall, after rough dress, be flooded with water by making small kiaries to enable the soil to settle down. Any local depression unevenness etc. shall be made good by dressing and/or filling with good soil.

20.2.3 Weeds or other vegetation which appear on the ground are then uprooted and removed and disposed off and paid.

20.2.4 **Trenching** Trenching shall consist of the following operations: 1. The whole plot shall be divided into narrow rectangular strips of about 1.5 m width or as directed by the Engineer-in-Charge. 2. These strips shall be sub-divided lengthwise into about 1 m long sections. Such sections shall be excavated serially and excavated soil deposited in the adjacent section preceding it. 3. In excavating and depositing care shall be taken that the top soil with all previous plant growth including roots, get buried in the bottom layer of trenched area, the dead plants so buried incidentally being formed into humus. 4. The excavated soil shall be straight away dumped into the adjoining sections so that double handling otherwise involved in dumping the excavated stuff outside and in back filling in the trenches with leads is practically eliminated.

20.2.5 **Measurements** Length and breadth of the plot shall be taken correct to 0.1 m and depths correct to cm. Cubical contents shall be calculated in cubic meters, correct to two places of decimal. No deduction shall be made nor extra paid for removing stones, brick bats and other foreign matter met with during excavation up to initial lead of 50 m and stacking the same.

20.2.6 **Rate** The rate shall include the cost of all labour and material involved in the operations described above, including cost of all precautionary measures to be taken for protections and supporting all services etc. met with during trenching. It does not include the cost of mixing of earth, sludge/manure.

20.3 GOOD EARTH

20.3.1 The earth shall be stacked at site in stacks not less than 50 cm high and of volume not less than 3.0 cum.

20.3.2 **Measurements:** Length, breadth and height of stacks shall be measured correct to a cm. The volume of the stacks shall be reduced by 20% for voids before payment, unless otherwise described.

20.3.3 **Rate:** The rate shall include the cost of excavating the earth from areas lying at distance not exceeding one km. from the site, transporting the same at site breaking of clods and stacking at places indicated. The rate shall also include royalty if payable.

20.4 OIL CAKE

20.4.1 **Neem/Castor:** The cake shall be free from grit and any other foreign matter. It should be undecorticated and pulverized. The material shall be packed in old serviceable gunny bags of 50 kgs capacity approximately. The weight of gunny bag shall be deducted @1 kg per bag and payment shall be made for net quantity. The quality of cake should be got approved by the Engineer-in-charge before supply.

- 20.4.2 **Measurements** The arrangement for weighing shall be made at site of work by the department. The gunny bags shall be the property of the government.
- 20.4.3 **Rate:** The rate shall include the cost of labour and material involved in all operations described above, including carriage up to site of work with all lead and lifts, weighing etc.
- 20.5 **SUPPLY AND STACKING OF SLUDGE**
- 20.5.1 It shall be transported to the site in lorries with efficient arrangement to prevent spilling reroute. It shall be stacked at site. Each stack shall not be less than 50 cm height and volume not less than 3 cum.
- 20.5.2 **Measurements** Length, breadth and depth of stacks shall be measured correct to a cm. The volume of the stack shall be reduced by 8% for looseness in stacking and to arrive at the net quantity for payment.
- 20.5.3 **Rate** The rate shall include the cost of labour and material involved in all operations described above, including carriage up to one km. The rate shall also include royalty if payable.
- 20.6 **SUPPLY AND STACKING OF MANURE**
- 20.6.1 **Farmyard Manure:** Same as 20.5.1.
- 20.6.2 **Measurements:** Same as 20.5.2.
- 20.6.3 **Rate :** Same as 20.5.3.
- 20.7 **ROUGH DRESSING OF THE TRENCHED GROUND**
- 20.7.1 Rough dressing of the area shall include making kiaries for flooding.
- 20.7.2 The trenched ground shall be levelled and rough dressed and if there are any hollows and depressions resulting from subsidence which cannot be so levelled, these shall be filled properly with earth brought from outside to bring the depressed surface to the level of the adjoining land and to remove discontinuity of slope and then rough dressed again. The supply and spreading of soil in such depressions is payable separately. In rough dressing, the soil at the surface and for 75 mm depth below shall be broken down to particle size not more than 10 mm in any direction.
- 20.7.3 **Measurements** Length, breadth of superficial area shall be measured correct to 0.1 metre. The area shall be calculated in sqm. correct to two places of decimal.
- 20.7.4 **Rate** The rate shall include the cost of all the labour and material involved in all the operations described above.
- 20.8 **UPROOTING WEEDS FROM TRENCHED AREAS**
- 20.8.1 After 10 days and within 15 days of flooding the rough dressed trenched ground with water, the weeds appearing on the ground shall be rooted out carefully and the rubbish disposed off as directed by the Engineer-in-charge.
- 20.8.2 **Measurements** Length, breadth of superficial area shall be measured correct to 0.1 meters. Superficial area of the weeded ground shall be measured for purpose of payments.
- 20.8.3 **Rate** The rate shall include the cost of all the labour and material involved in all the operations described above.
- 20.9 **FINE DRESSING THE GROUND**
- 20.9.1 Slight unevenness, ups, and downs and shallow depressions resulting from the settlement of the flooded ground, in drying and from the subsequent weeding operations, shall be removed by fine dressing the surface to the formation levels of the adjoining land as directed by the Engineer-in-charge, and by adding suitable quantities of good earth brought from outside, if necessary.
- 20.9.2 **Measurements** Length, breadth and depth of stacks shall be measured correct to a cm. The area shall be calculated in sqm. correct to two places of decimal.
- 20.9.3 **Rate** The rate shall include the cost of all the labour and material involved in all the operations described above.
- 20.10 **SPREADING GOOD EARTH**
- 20.10.1 Good earth shall be removed from stacks by head load and spread evenly over the surface to the thickness ordered by the Engineer-in-charge. It shall be spread with a twisting motion to avoid segregation and to ensure that spreading is uniform over the entire area.
- 20.10.2 **Measurements:** The quantity of good earth spread shall be determined by the difference in the volume of good earth in stacks before and after spreading duly reduced for looseness in stacking by 20% of good earth.
- 20.10.3 **Rate:** The rate shall include of all the labour and material involved in all the operations described above, but does not include the cost of the good earth which shall be paid for separately unless specifically described in the item.
- 20.11 **SPREADING SLUDGE/MANURE**

- 20.11.1 Good earth shall be thoroughly mixed with sludge or manure in specified proportion as described in the item or as directed by the Engineer-in-Charge. The mixing shall be spread as described in 20.10.1 to the thickness ordered by the Engineer-in-Charge.
- 20.11.2 **Measurements** The quantity of good earth and sludge or manure mixed shall be determined by the difference in the volume of good earth and sludge or manure in stack, before and after spreading duly accounted for voids and looseness in stack.
- 20.11.3 **Rate** The rate shall include of all the labour and material involved in all the operations described above, but does not include the cost of good earth sludge or manure which shall be paid for separately, unless otherwise described in the item.
- 20.12 **MIXING OF GOOD EARTH AND SLUDGE/MANURE**
- 20.12.1 The stacked earth shall, before mixing be broken down top particle of sizes not exceeding 6 mm in any direction. Good earth shall be thoroughly mixed with sludge or manure in specified proportion as described in the item or as directed by the Engineer-in-charge.
- 20.12.2 **Measurements** The quantity of good earth and sludge or manure mixed shall be determined by the difference in the volume of good earth, sludge or manure in stack, before and after spreading duly accounted for voids and looseness in stack.
- 20.12.3 **Rate** The rate shall include the cost of all labour and materials involved in all the operations described above, but does not include the cost of good earth sludge or manure which shall be paid for separately, unless otherwise described in the item.
- 20.13 **GRASSING WITH SELECT GRASS NO. 1**
- 20.13.1 The area from where the grass roots are to be obtained shall be specified by the Engineer-in-Charge at the time of execution of the work and no royalty shall be charged on this account from the contractor. **Grass is to be arranged by contractor (cost of grass to be paid separately).**
- 20.13.2 The soil shall be suitably moistened and then the operation of planting grass shall be commenced. The grass shall be dibbled at 10 cm, 7.5 cm, 5 cm apart in any direction or other spacing as described in the item. Dead grass and weeded shall not be planted. The contractor shall be responsible for watering and maintenance of levels and the lawn for 30 days or till the grass forms a thick lawn free from weeded and fit for moving whichever is later. Generally planting in other direction at 15 cm, 10 cm, spacing is done in the case of large open spaces, at 7.5 cm spacing in residential lawn and at 5cm spacing for Tennis Court and sports ground lawn. Rates are including cost of labour and material **(grass shall be paid separately.)**
- 20.13.3 During the maintenance period, any irregularities arising in ground levels due to watering or due to trampling by labour, or due to cattle straying thereon, shall be constantly made up to the proper levels with earth as available or brought from outside as necessary, Constant watch shall be maintained to ensure that dead patches are replanted and weeds are removed.
- 20.13.4 **Measurements** Length, breadth of the lawn grassed shall be measured correct to 0.1 meter and the area shall be calculated in sqm. correct to two places of decimal.
- 20.13.5 **Rate** The rate shall include of all the labour and material involved in all the operations described above, excluding supply of the requisite quantity of good earth and grass so needed for properly maintaining the levels of the lawns. **(payment of grass to be paid separately).**
- 20.14 **RENOVATION OF LAWNS**
- 20.14.1 The area shall be first weeded out of all undesirable growth. The entire grass shall be scrapped (cheeled) without damaging roots and level of the grounds. Slight irregularities in surface shall be levelled off and the area shall then be forked so as to aerate the roots of the grass without, however uprooting them. Specified quantity of sludge or manure shall than be spread uniformly with wooden straight edge (phatti) as directed by the Engineer-in-charge. The area shall then be slightly sprinkled with water so as to facilitate proper integration of the manure or sludge with the soil and later flooded. The contractor shall be responsible for watering, proper maintenance and tending of the lawn for 30 days or till the grass forms a lawn fit for mowing, whichever is later. During the above operations, all undesirable growths shall be constantly weeded out and all rubbish removed and disposed off as directed by the Engineer-in-Charge.
- 20.14.2 **Measurements** Length, breadth of the lawn renovated shall be measured correct to 0.1 meter and the area shall be calculated in sqm. correct to two places of decimal.
- 20.14.3 **Rate** The rate shall include of all the labour and T&P (excluding RH pipe/grass) involved in all the operations described above, excluding the supply of the requisite quantity of good earth if so needed for proper maintenance of the levels of the lawns. The cost of the sludge

or manure shall be measured and paid for separately, unless its supply is specifically included in the description of the item.

20.15 UPROOTING RANK VEGETATION AND WEEDS AND PREPARING THE GROUND FOR PLANTING 'SELECT GRASS NO. 1'

20.15.1 Initially the area shall be dug up to a depth of 30 cm. and weeds and rank vegetarian with roots removed thereon by repeated forking. The whole area then shall be retrenched to a depth of 60 cm in the same manner as described in 23.1. Clods of excavated earth shall then be broken up to the size not more than 75 mm in any direction. The area shall then be flooded with water and after 10 days and within 15 days of flooding, weeds shall be uprooted carefully. The rubbish arising from the above operations shall be removed and disposed off in a manner directed by the Engineer-in-charge, away from the site. The earth shall then be rough dressed and fine dressed as described in 20.7 & 20.9.

20.15.2 **Measurements** Length, breadth of uprooted area shall be measured correct to 0.1 meter and the area shall be calculated in sqm. correct to two places of decimal.

20.15.3 **Rate** The rate shall include the cost of all the labour and material involved in all the operations described above.

20.16 EXCAVATION AND TRENCHING FOR PREPARATION OF BEDS FOR HEDGE AND SHRUBBERY

20.16.1 Beds for hedges and shrubbery are generally prepared to width of 60 cm. to 125 cm. and 2 to 4 meters respectively.

20.16.2 Beds for hedges and shrubbery shall be prepared in the following manner. The beds shall first be excavated to a depth of 60 cm. and the excavated soil shall be stacked on the sides of the beds. The surface of the excavated bed shall then be trenched to a further depth of 30 cm, in order to loosen the soil, in the manner described in 20.2. No flooding will be done at this stage but the top surface shall be rough dressed and levelled. The excavated soil from the top 60 cm depth of the bed stacked at the site shall then be thoroughly mixed with sludge over manner in the proportion 8:1 by ratio or other proportion described in the item. The mixed earth and manure shall be refilled over the trenched bed, levelled neatly and profusely flooded so that the water reaches even the bottom most layers of the trenched depth of the bed. The surface after full subsidence shall again be refilled with the earth and manure mixture, watered and allowed to settle and finally fine dressed to the level of 50 mm to 75 mm below the adjoining ground or as directed by the Engineer-in-Charge. Surplus earth if any, shall be disposed off as directed by the Engineer-in-charge. Any surplus earth if removed beyond initially lead shall be paid separately. Stones, bricks bats and other foreign matter if met with during excavation or trenching shall be removed and stacked within initially lead & lift, such material as is declared unserviceable by the Engineer-in-charge shall be disposed by spreading and levelling at places ordered by him. If disposed outside the initial lead & lift, then the transport for the extra leads will be paid for separately. If a large proportion of material unsuitable for the hedging and shrubbery operations is met with and earth from outsides is required to be brought in for mixing with manure and filling, the supply and stacking of such earth will be paid for separately.

20.16.3 **Measurements** Length, breadth and depth of the pit excavated and trenched shall be measured correct to a cm. The cubical contents shall be calculated in cubic meter correct to two places of decimal.

20.16.4 **Rate** The rate shall include the cost of all the labour and material involved in all the operations described above. The rate shall not include the cost of supply & stacking of the manure unless the same is specifically included in the description of the item.

20.17 DIGGING HOLES FOR PLANTING TREES

20.17.1 In ordinary soil, including refilling earth after mixing with oil cake, manure and watering.

20.17.2 Holes of circular shape in ordinary soil shall be excavated to the dimensions described in the items and excavate soil broken to clods of size not exceeding 75 mm in any direction, shall be stacked outside the hole, stones, brick bats, unsuitable earth and other rubbish, all roots and other undesirable growth met with during excavation shall be separated out and unserviceable material removed from the size as directed. Useful material, if any, shall be stacked properly and separately. Good earth in quantities as required to replace such discarded stuff shall be brought and stacked at site by the contractor which shall be paid for separately. The tree holes shall be manured with powdered Neem/castor oil cake at the

specified rate along with farm yard manure over sludge shall be uniformly mixed with the excavated soil after the manure has been broken down to powder, (size of particle not be exceeded 6 mm in any direction) in the specified proportion, the mixture shall be filled in to the hole up to the level of adjoining ground and then profusely watered and enable the soil to subside the refilled soil shall then be dressed evenly with its surface about 50 to 75 mm below the adjoining ground level or as directed by the Engineer-in-charge.

20.17.3 **Measurements** : Holes shall be enumerated.

20.17.4 **Rate**: The rate shall include the cost of all the labour and material involved in all the operations described above, excluding the cost of supply and stacking the requisite quantity of manure/sludge and oil cake.

20.18 **In Soil other than Ordinary Soil**

20.18.1 Where holes are dug in (a) Hard soil (b) Ordinary rock or (c) Hard rock, the above soils occurring independently over in conjunction with each other and /or ordinary soil in any hole, the different excavated soil shall be stacked separately. Excavation in hard rock shall be carried out by chiselling only.

20.18.2 The stack measurement of ordinary rock and hard rock shall be reduced by 50% and of soil by 20% to arrive at the excavated volume. This excavation shall be paid for as extra over the rate for holes dug in ordinary soil above, at rate appropriate to particular soil concerned.

20.18.3 Sufficient quantity of good soil to replace the solid volume of stones, brick bats, unsuitable earth and other rubbish, all roots and other undesirable growth, ordinary and hard stacks shall be brought and stacked at site but the supply and stacking of such shall be paid for separately.

20.18.4 The useless excavated stuff shall be disposed off by spreading at places as ordered by the Engineer-in-charge. If such places are outside initially leads, carriage for the extra lead shall be paid for separately.

20.18.5 The ordinary soil excavated from the hole and the earth brought from outside shall then be mixed with manure screened through sieve of IS designation 16 mm in the proportion specified in the description of the item and filled with the pit and the same watered and finally dressed.

20.18.6 **Measurements**: The pit shall be enumerated. The volume of excavation in soil and other than a ordinary soil shall be determined by reducing the stack volume of the relevant soil with respective percentage for voids specified in 20.16.2.

20.18.7 **Rate**: The rate shall include the cost of all the labour and material involved in all the operations described above, including mixing refilling, watering, dressing etc. but shall not include (a) cost of manure over sludge (b) cost of supplying and stacking of good earth for replacement and (c) the cost of carriage beyond initial lead for disposing off useless materials. The excavation other than that of ordinary soil shall be paid extra over and above the rate if excavation in ordinary soil.

20.19 **M.S. FLAT IRON TREE GUARD**

20.19.1 **M.S. Iron Riveted Tree Guard**

20.19.1.1 The tree guard shall be 600 mm in diameter and 2 meter high above ground level and 25 cm in below ground level.

20.19.1.2 The tree guard shall be framed of 4 nos. 25 x 6 mm M.S. flat 2 meter long excluding displayed outward at lower and upto an extent 10 cm and 8 nos. 25 x 3 mm vertical M.S. Flat Riveted to 3 Nos. 25 x 6 mm Flat iron rings in two halves, bolted together 8 mm dia and 30 mm long M.S. bolts and nuts. The entire tree guard shall be given two coats of synthetic enamel paint of approved brand and manufacturer of required shade over a priming coat of ready mixed steel primer of approved brand and manufacturer. The design of tree guards shall be shown in the drawing.

20.19.1.3 **Measurement** : The tree guard shall be enumerated.

20.19.1.4 **Rate**: The rate shall include the cost of all the labour and material involved in all the operations described above.

20.19.2 **M.S. Flat Iron Welded Tree Guard**

20.19.2.1 The tree guard shall be 600 mm in diameter and 2 meter high above ground level and 25 cm in below ground level.

20.19.2.2 The tree guard shall be framed of 4 nos. 25 x 6 mm MS. Flat 2 metres long excluding displayed outward at lower and upto an extent 10 cm and 8 Nos. 25 x 3 mm vertical M.S. Flat Riveted to 3 nos. 25 x 6 mm flat iron rings in two halves, bolted together 8 mm dia and 30 mm long M.S. Bolts & nuts. The entire tree guard shall be given two coats of synthetic enamel paint of approved brand and manufacturer of required shade brand and manufacturer of required shade over a priming coat of

ready mixed steel primer of approved brand and manufacturer. The design of tree guards shall be shown in the drawing.

20.19.2.3 **Measurement** : The tree guard shall be enumerated.

20.19.2.4 **Rate**: The rate shall include the cost of all the labour and material involved in all the operations described above.

20.20 **FILLING MIXTURE OF EARTH & SLUDGE OVER MANURE**

20.20.1 The separately specified earth and sludge shall be broken down to particles of size not exceeding 6 mm in any directions before mixing. Good earth shall be thoroughly mixed with sludge over manure in specified proportions as directed by Officer-in-Charge. During the process of preparing the mixture as above, trenches shall be flooded with water and levelled.

20.20.2 **Measurements** Measurement shall be made in (Length, breadth and height of stacks) cubic meter. The cubical contents shall be worked out to the nearest two places of decimal in cubic meter.

20.20.3 **Rate** The rate shall include the cost of all the labour and material involved in all the operations described above, but do not include the good earth, sludge or manure which will be paid separately.

20.21 **EXCAVATION OF DUMPED STONE OR MALBA**

20.21.1 Excavation operations shall include excavation and getting out water if required. During the excavation stone, brick bats and other foreign material if met shall be removed and stacked within meter leads and lifts. Such material as is declared unserviceable by the Engineer-in-Charge be disposed within 50 m. The excavated surface shall be neatly dressed and levelled.

20.21.2 **Measurements** Measurement shall be made in (Length, breadth and height of stacks) cubic meter. The cubical contents shall be worked out to the nearest two places of decimal in cubic meter.

20.21.3 **Rate** The rate shall include the cost of all the labour and material involve in all the operations described above.

20.22 **EXCAVATION IN BAJRI PATH**

20.22.1 All excavated operations shall include excavation and stacking of serviceable and unserviceable material. Excavated surface of Bajri path shall be removed and stacked upto 50 meter lead and disposed material neatly dressed.

20.22.2 **Measurements** Same as 20.21.2.

20.22.3 **Rate** Same as 20.21.3.

20.23 **23.20 EXCAVATION OF WATER BOUND MACADAM**

20.23.1 All excavated operations shall include excavation, stacking of serviceable and unserviceable material. Excavation shall be straight and uniform in width. Soling stone and aggregate obtained from excavation of W.B.M. shall be stacked separately and unserviceable material disposed off with lead up to 50 meter and lifts up to 1.50 meter and neatly dressed.

20.23.2 **Measurements** Measurement shall be made in (Length, breadth and height of stacks) cubic meter. The cubical contents shall be worked out to the nearest two places of decimal in cubic meter.

20.23.3 **Rate** The rate shall include the cost of all the labour and material involved in all the operations described above.

20.24 **FLOODING THE GROUND WITH WATER AND MAKING KIARIES**

20.24.1 The water for flooding shall be of soft water and free from chemical and good for growing the trees and shrubs etc. Before flooding the kiaries shall be made in required size and shape as per directions of Officer-in-charge. After uprooting weeds from the trenched area and uprooting vegetation, kiaries shall be dismantled.

20.24.2 **Measurements** Measurement shall be made in sqm. of area.

20.24.3 **Rate** The rate shall be for 100 sqm of area and include the cost of all the labour and material involved in all the operations described above.

21 **Road Works**

21.1 **SCOPE OF WORK**: The work contemplated under these specifications refers to Earth work in Excavation, Forming Embankments, Soling, W.B.M., Bituminous Macadam, Wearing Course/Sealing Coat etc. for road and pavement works

21.2 **EARTH WORK IN EXCAVATION** : The specifications for "Earth work" under chapter - 3, specified here-in-before shall hold good as far as they are applicable.

21.3 **FORMING EMBANKMENT** :

21.3.1 The work shall include preliminaries of clearing site, setting out and preparing the ground and there after forming embankment for the roads, paths etc. with approved material available form excavations under this contract (excavation paid separately under respective items) or elsewhere, spreading in layers, watering and compacting to the required density

and lines, curves, grades, camber and cross section and dimensions shown in the plan or as directed by the Engineer-in-Charge. When the embankment is to be laid on hill sides or slopes, the existing slopes are to be ploughed deeply. If the cross slopes are steeper than 1 in 3, steps with reverse slope shall be cut into the slopes to give proper hold and seating to the bank as directed by the Engineer-in-Charge. The top 15 cm. of soil shall be scarified and watered if directed and compacted to the same density as specified for the embankment before any material is laid for the embankment work.

- 21.3.2 Only the approved excavated earth shall be placed in the embankments in successive horizontal layers not exceeding 200 mm. extending to the full width of the embankment including the slopes at the level of the particular layer and 30 cm. more on both sides to allow compaction of the full specified section. The extra loose stuff at the edges shall be trimmed later after completion of the bank work without extra cost leaving the correct section fully compacted.
- 21.3.3 Keeping the width of the bank initially less and widening it later by dumping loose earth on the slopes shall not be permitted as the additional width and slopes will remain loose and uncompacted. Similar procedure to extend the embankment by dumping the material longitudinally shall also not be allowed. Each layer of the embankment shall be watered, levelled and compacted as specified here-in-after, before the succeeding layers are placed. The surface of the embankment shall at all times during construction, be maintained in such a manner so as to prevent ponding. Water to be used shall be free from all harmful elements which may cause efflorescence etc. and approved by the Engineer-in-Charge.
- 21.3.4 If the material for embankment contains moisture less than the optimum moisture, water shall be added in the 100 mm. layers of the embankment to bring moisture uniformly up to requirement. If the excavated material contain more than required moisture, it shall be allowed to dry until the moisture is reduced to required extent. If due to the wetness, the moisture content of the soil cannot be reduced to the appropriate amount by exposure; embankment work shall be suspended till suitable conditions prevail at no extra claim/compensation.
- 21.3.5 When loose layer is levelled manually or mechanically and moistened or dried to uniform moisture content suitable for maximum compaction, it shall be compacted by 8 to 10 tonne power roller or sheep foot rollers or heavy hauling or dozing equipment to give the specified 90% of the proctor density. If on testing, the density is found to be less than 90% of the proctor density, the contractor shall do additional compaction necessary to get the specified density after adding water if required. If the density cannot be improved by such reasonable efforts, the work may be accepted as substandard work by the Engineer-in-Charge, if he thinks it is not harmful for the purpose and paid for at a reduced rate. Test shall be made to determine the maximum density of the material to be used by the proctor method before starting the work. Density test shall be carried out for the embankment work during the progress of the work. One set of three core samples for every 1000 sqm. (about 1000 sq.yd.) area of each layer of embankment work shall be taken and tested. The average density shall not be less than 90% of the proctor density, obtained in the laboratory.
- 21.3.6 Arrangement for obtaining the samples and transporting the same to laboratory, shall be made by the contractor at his own cost. Embankment not accessible to rollers, such as those adjoining bridges, culverts and other works shall be carried out independently of the main embankments and shall have the layers placed in 150 mm. to 200 mm. height and each layer shall be moistened and thoroughly compacted with mechanical or manual tamper. Before placing the next layer, the surface of the under layer shall be moistened and scarified so as to provide a satisfactory bond with the next layer.
- 21.3.7 The embankment shall be finished and dressed smooth and even, in conformity with the alignment levels and cross sections and dimensions shown on the drawing. On curves, section shall be provided with super elevation and increased width, as shown on the plans as directed by the Engineer-in-Charge.
- 21.3.8 Joining of old and new embankments shall be done by stepping in an overall slope of about 1 to 5.
- 21.3.9 The contractor shall be responsible for maintaining the embankment work in satisfactory conditions at his own cost till finally accepted including making good any damage.

21.4 MEASUREMENT AND RATE :

- 21.4.1 The contract rate shall be per cubic metre of the finished embankment. Measurements shall normally be taken by taking cross sections at suitable intervals. The measurements of the section shall be limited to the dimensions shown on the drawing or those ordered by the Engineer-in-Charge in writing. The sectional area shall be worked out correct up to two

places of decimal of square metre and the quantity worked out to two places of decimal of cubic metre on lines similar to those specified for earth work here-in-before.

21.5 SUB GRADE :

21.5.1 **Preparation of Sub-Grade :** The surface of the formation for a width of sub-base, which shall be as per drawing shall first be cut to a depth equal to the combine depth of sub-base and surface courses below the proposed finished level (due allowance being made for consolidation). It shall then be cleaned of all foreign substances. Any ruts or soft yielding patches that appear due to improper drainage conditions, traffic hauling or from any other cause, shall be corrected and the sub-grade dressed off parallel to finished profile.

21.5.2 **Consolidation :**

21.5.2.1 The sub-grade shall be consolidated with a power road roller of 8 to 12 tonnes. The roller shall run over the sub-grade till the soil is evenly and densely consolidated and behaves as an elastic mass (the roller shall pass a minimum of 5 runs on the sub-grade). All undulations in the surface that develop due to rolling shall be made good with fresh material or quarry spoils as the case may be and the sub-grade is rerolled.

21.5.2.2 **Surface Regularity:** The finished surface shall be uniform and conform to the lines, grades and typical cross sections shown in the drawings. When tested with the template and straight edge, the variation shall be within the tolerances specified in the Table below :

PERMISSIBLE TOLERANCES OF SURFACE REGULARITY

Longitudinal profile	Cross profile
Maximum permissible undulation when measured with a 3 metre straight edge template.	Maximum permissible variation from specified Profile when measured with a camber-
24mm	15mm

Where the surface irregularity of the sub-grade falls outside the specified tolerances, the contractor shall be liable to rectify these with fresh material or quarry spoils as the case may be, and the sub grade rerolled to the satisfaction of the Engineer-in-charge.

21.5.2.3 **Measurement & Rate:** The length and width shall be measured correct to a cm. The area shall be worked out in square metre, correct to two places of decimal. The rate shall include the cost of materials and labour required for all the operations mentioned above, unless specified otherwise.

21.6 SUB-BASES :

21.6.1 **Water Bound Macadam Sub-base with stone aggregate :** Stone aggregate of size 90 mm to 45 mm shall be used. This consists of clean crushed coarse aggregate mechanically interlocked by rolling using power road roller of 8 to 10 tonnes and voids thereof filled with screening and blinding material with the assistance of water, laid on a prepared subgrade/sub-base.

21.6.2 **SPECIFICATIONS FOR LAYING :** Quantities of Materials : Quantities of coarse aggregate, screening & blinding material required to be stacked for 100 mm approx. compacted thickness of WBM sub-base course for 10 Sqm. shall be as per table given below:

	Coarse		Stone Screenings		Blinding Materials
Classification	Size Range	Net Qty.	Grading/Classification and size	Net Qty	
Grading - I	90mm to 45mm	1.2 Cum. to 1.28 Cum	Type A 13.2 mm	0.27 Cum. to 0.30 Cum	0.08 cum

NOTE : Net Quantity = Loose Quantity measured in stack minus 7.5%

- 21.6.3 **Preparation of Foundation :** In the case of an existing unsurfaced road, where new materials is to be laid, the surface shall be scarified and reshaped to the required grade, camber and shape as necessary. Weak places shall be strengthened, corrugations removed and depressions and pot holes made good with suitable materials, before spreading the aggregate for W.B.M.
- 21.6.4 **Spreading Aggregate :** The coarse aggregate shall be spread uniformly and evenly upon the prepared base in required quantities with a twisting motion to avoid segregation. In no case shall these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed base be permitted. The aggregates shall be spread uniformly to proper profile by using templates placed across the road six metres apart. Where specified, approved mechanical devices may be used to spread the aggregates uniformly. The levels along the longitudinal direction upon which the metal shall be laid, shall be first obtained at site to the satisfaction of Engineer-incharge and these shall be adhered to.
- 21.6.5 The surface of the aggregate spread shall be carefully trued up and all high or low spots remedied by removing or adding aggregate as may be required.
- 21.6.6 The W.B.M. sub-base shall be normally constructed in layers of 115 mm compacted thickness. No segregation of large or fine particles shall be allowed and the coarse aggregate as spread shall be of uniform gradation with no pockets of fine material.
- 21.6.7 The coarse aggregate shall normally not be spread in lengths exceeding three days average work ahead of the rolling and blending of the proceeding section.
- 21.6.8 **Rolling :** Immediately following the spreading of the coarse aggregate, it shall be compacted to the full width by rolling with either a three-wheel power roller of 8 to 10 tonnes capacity or an equivalent vibratory roller. Initially, light rolling is to be done which shall be discontinued when the aggregate is partially compacted with sufficient void space in them to permit application of screenings.
- 21.6.9 The rolling shall begin from the edges with the roller running forward and backward and adding the screenings simultaneously until the edges have been firmly compacted. The roller shall then progress gradually from the edges to the centre, parallel to the centre line of the road and overlapping uniformly each preceding rear wheel track by one half width and shall continue until the entire area of the course has been rolled by the rear wheel. Rolling shall continue until the road metal is thoroughly keyed with no creeping of metal ahead of the roller. Only slight sprinkling of water may be done during rolling, if required. On super elevated curves, the rolling shall proceed from the lower edge and progress gradually continuing towards the upper edge of the pavement.
- 21.6.10 Rolling shall not be done when the sub-grade is soft or yielding or when the rolling causes a wave like motion in the sub-base or sub-grade. When rolling develops irregularities that exceed 12 mm when tested with a three metre straight edge, the irregular surface shall be loosened and then aggregate added to or removed from it as required and the area rolled until it gives a uniform surface conforming to the desired cross-section and grade. The

surface shall also be checked transversely by template for camber and any irregularities corrected in the manner described above. In no case shall the use of screenings to make up depressions be permitted.

- 21.6.11 **Application of Screenings:** After the coarse aggregate has been lightly rolled to the required true surface, screenings shall be applied gradually over the surface to completely fill the interstices. Dry rolling shall be continued while the screenings are being spread so that the jarring effect of the roller causes them to settle into the voids of the coarse aggregates. The screenings shall not be dumped in piles on the coarse aggregate but shall be spread uniformly in successive thin layers either by the spreading motion of the hand, shovels or a mechanical spreader.
- 21.6.12 The screenings shall be applied at a slow rate (in three or more applications) so as to ensure filling of all voids. Rolling and brooming shall continue with the spreading of the screenings. Either mechanical brooms or hand brooms or both may be used. In no case shall the screenings be applied, so fast and thick as to form cakes, ridges on the surface making the filling of voids difficult, or to prevent the direct bearing of the roller on the coarse aggregates. The spreading, rolling and brooming of screenings shall be performed on sections which can be completed within one day's operation and shall continue until no more screenings can be forced into the voids of the coarse aggregate. Damp and wet screenings shall not be used under any circumstances.
- 21.6.13 **Sprinkling and Grouting :** After spreading the screening and rolling, the surface shall be copiously sprinkled with water, swept and rolled. Hand brooms shall be used to sweep the wet screening into the voids and to distribute them evenly. The sprinkling, sweeping and rolling operations shall be continued and additional screenings applied where necessary until the coarse aggregates are well bonded and firmly set for the entire depth and until a grout has been formed of screenings and water that will fill all voids and form a wave of grout ahead of the wheels of the roller. The quantity of water to be used during the construction shall not be excessive so as to cause damage to the sub-base or sub-grade.
- 21.6.14 **Application of Blinding Material:** After the application of screenings and rolling, a suitable blinding material shall be applied at a uniform and slow rate in two or more successive thin layers. After each application of blinding material, the surface shall be copiously sprinkled with water and the resulting slurry swept-in with hand brooms or mechanical brooms or both so as to fill the voids properly. The surface shall then be rolled by a 8-10 tonne roller, water being applied to the wheels in order to wash down the blinding material that may get stuck to the wheels. The spreading of blinding material, sprinkling of water, sweeping with brooms and rolling shall continue until the slurry that is formed well, after filling the voids form a wave ahead of wheels of the moving roller.
- 21.6.15 **Setting and Drying :** After final compaction of the course, the road shall be allowed to cure overnight. Next morning defective spots shall be filled with screenings or blinding material, lightly sprinkled with water, if necessary and rolled. No traffic shall be allowed till the macadam sets.
- 21.6.16 **Surface Evenness:** The surface evenness of completed W.B.M. sub-base in the longitudinal and transverse directions shall be as specified in the table given below:

21.6.17

Size of coarse aggregates	Longitudinal profile	Cross profile
	Max. permissible undulation When measured with a 3 M straight edge	Max. permissible undulation When measured with a camber template
45-90 mm	15 mm	12 mm

The longitudinal profile shall be checked with a 3 M long straight edge at the middle of each traffic lane along a line parallel to the centre line of the road. The transverse profile shall be checked with a series of three camber boards at intervals of 10 M.

21.6.18 **Rectification of Defective Construction:** Where the surface irregularity of the WBM sub base course exceeds the tolerances specified in the table given above or where the course is otherwise defective due to sub-grade soil mixing with the aggregates, the layer to its full thickness shall be scarified over the affected area, reshaped with added material or removed and replaced with fresh material as applicable, and re-compacted. The area treated in the aforesaid manner shall not be less than 10 Sqm. In no case shall depressions be filled up with screenings and blinding material.

21.6.19 **Measurements & Rate:** The length and breadth shall be taken to the nearest centimetre and thickness to the nearest half centimetre. The consolidated cubical contents shall be calculated in cubic metres correct to two places of decimals. The rate shall include the cost of all labour and materials involved in all the operations described above.

21.7 **RUBBLE SOLING :**

21.7.1 Rubble soling for road work including foot paths, culverts, side drains etc. shall be carried out as specified here-in before under Chapter for Rubble stone soling, so far as they are applicable, with the following additions:

21.7.2 Subgrade for soling shall be prepared by cleaning of all foreign substances including rank vegetation, if any. Any ruts or soft yielding places that appear due to improper drainage conditions, traffic, hauling or from any other cause, shall be corrected by filling/cutting up to 150 mm. and compacted and the subgrade dressed off parallel to the finished profile and the same shall be approved by the Engineer-in-Charge, before laying of soling. Soling shall be laid in regular lines and staggered joints. The stones shall be laid as closely as possible and packed well. The stones shall be so laid as to have their bases and the largest area resting on the subgrade and in contact with each other.

21.7.3 Soling shall be laid to proper gradient and camber which shall be checked frequently to ensure accuracy. Rolling shall then be carried out by a 8 to 10 tonne power roller and soling consolidated properly shall be lightly sprinkled during rolling, if ordered by the Engineer-in-Charge.

21.7.4 The surface thus prepared shall first be passed by the Engineer-in-Charge, after which 40 mm. to 50 mm. thick layer of selected hard murrum available from excavation shall be spread over the soling as directed by the Engineer-in-Charge, and rolled again such that the hard murrum gets into the interstices. It shall, however, be ensured that a thin layer of murrum/grit shall remain on the finished surface of soling.

21.7.5 The area of soling actually done of specified consolidated thickness limiting to the dimensions as per drawing, shall be measured in square metre up to two decimal places.

21.8 **WATER BOUND MACADAM :**

21.8.1 Metal : Metal required for water bound macadam surfacing shall be broken from the first sort rubble. The rubble shall be broken to required size by the contractor at his own cost. However, the metal required for water bound macadam shall conform to I.R.C. specification in all respects. It shall be hard, sound, trap stone metal free from decay and weathering and obtained from approved quarries, and shall be of 50 mm. nominal size.

- 21.8.2 Collection of metal : Metal shall be of first sort black trap stone and shall be collected in stacks on level ground and stacked on the sides of the road as directed. The metal shall be free from all earth, rubbish and vegetable matter and graded before stacking and closely packed in stacks. The metal supplied by the contractor shall be arranged in stacks for measurement. No deductions will be made for voids. The size of stack shall be 1 m. wide at top, 2.2 m. wide at bottom and 60 cm. high. The length shall be as directed by the Engineer-in-Charge. The contractor shall provide the templates required to ensure, compliance with size of stack stipulated.
- 21.8.3 Supply of Murrum : The contractor shall be permitted to excavate in the selected areas in the township/site of work, as approved by the Engineer-in-Charge, for collection of murrum. The excavation shall be done by the contractor to correct line and level, transport and stack the same at site of work as directed by the Engineer-in-Charge. Alternately, the contractor will be permitted to bring from outside, approved graded hard murrum 10 mm. down to dust (but not silt) as directed by the Engineer-in-Charge and shall also be collected in stacks on level ground along side of the road. The stacks shall be measured in cubic metre for payment before using it for blinding. No deduction shall be made for voids.
- 21.8.4 **Laying and preparation of water bound macadam surface:**
- 21.8.4.1 After preparation of the existing surface as specified above, 50 mm size metal collected in stacks shall be spread to uniform thickness over the prepared surface and consolidated to 75 mm thickness as specified here-in-after.
- 21.8.4.2 Templates properly made of full width and gauge or templates fitted with central plumb to each edge fixed with it must be used. The depth of the plank forming the gauge shall be the thickness of the metal layer in loose state so that when the metal has been properly spread, the gauges are buried just flush with the surface. The intermediate work shall be tested with cord stretched between the gauge. Three templates shall be provided and used with a distance of about 7.5 Metres between each but not exceeding 15 Metres. A spirit level shall invariably be used with the templates to ensure that the edges of metalling are truly levelled. The metal shall be spread and rolled with 8 to 10 tonne power roller until well compacted and there is no appreciable movement (in the metal) when walked upon, or no appreciable wave in front of the advancing roller. Rolling shall be done by roller perfectly, by a 8 to 10 tonne power roller, till proper internal packing of adjacent pieces of stones has been achieved. Excessive dry rolling shall be avoided.
- 21.8.4.3 Rolling shall commence from the edge to the centre of the road. In case of super elevated curve, rolling shall commence from the inside edge of the centre and progress towards the outside edge. Where the gradient is steeper than 1 in 60, the roller shall run up grade, i.e. rolling shall be started from lower level to upward direction for the 1st. rolling.
- 21.8.4.4 While rolling the surface in two or more parts, a strip of about 230 mm. to 300 mm. along the predetermined cross section shall be left unrolled while consolidating the first half. This shall be properly jointed when the metal is being spread on the second half and consolidated with it. Care must be taken to avoid the occurrence of a continuous longitudinal furrow along cross section of the road. Full width of road will be rolled at a time.
- 21.8.4.5 The metalling shall be moderately kept saturated and rolling continued until consolidation is completed. Just enough watering shall be done so as to flush the metal slurry into the interstices. Care shall be taken to avoid excess water softening the subsoil. The full consolidation stage shall be tested by (a) putting a piece of metal about the size of wal-nut on the surface and roller passed over it. If it is crushed the surface shall be deemed as well consolidated (b) there shall be no creeping of stone ahead of the roller.
- 21.8.4.6 Until the above conditions are satisfied, no blinding or surfacing materials shall be put on the surface. No rolling shall be done where signs of metal crushing are noticed or rolling causes wave like motions in the base course of sub-grade. Over rolling shall not be done. About 20 to 30 trips of the roller shall normally suffice to make the surface well compacted. Before starting rolling, the metal shall be dressed accurately to camber. No fresh metal shall be added once dry consolidation has commenced. The part of the road must be fully raked up so that the metal is thoroughly incorporated into the body of road.

- 21.8.5 **Blinding Course:** When the required consolidation has been completed, the blinding material of approved graded murrum/stone grit and dust (unscreened) as specified shall be spread over the surface and brushed backwards and forwards to fill in the surface voids and rolling and watering continued to such an extent that the blinding materials are formed into a slurry and is grouted into the interstices. After the road has been fully consolidated, the surface shall be covered with 12 mm layer of murrum/stone grit and dust (unscreened) and road opened to traffic after 4 days. The road shall be kept watered for 14 days or such other period as specified by the Engineer-in-charge. Where tracks are likely to be formed by the traffic on the road, barriers such as tree branches etc. shall be put to divert the traffic. After 15 days, light watering and rolling shall be done. For joints across the road, the end of each layer shall be given a flat slope and well consolidated together and hump formation must be avoided.
- 21.8.6 Damages to the Department's Property: Any damage to the Deptt's property due to negligence of the contractor while executing the work shall be made good to the original condition at his own cost.
- 21.8.7 **MODE OF MEASUREMENT:** The areas of water bound macadam road surfaces of required thickness actually completed as per above specifications limiting to the areas as per drawing shall be measured in square metre up to two places of decimal for payment. The item includes laying, spreading, watering, consolidation, blinding etc. but excluding the cost of 50 mm size I.R.C. metal and graded murrum which will be paid under relevant item. However Murrum obtained from excavation work under this contract and used as blinding material as above on instructions/approval of the Engineer-in-charge shall not be paid.
- 21.9 **BITUMINOUS MACADAM & BITUMINOUS CONCRETE SURFACING FOR ROAD (GENERAL) :**
SCOPE OF WORK :
- 21.9.1 The work covered under these specifications provides for bituminous treatment for roads consisting of providing 38 mm thick bituminous macadam and 12 mm thick seal coat or bituminous concrete of thickness as specified in item in the schedule of quantities. The contractor shall make at his own cost, all the arrangements for controlling the traffic during the execution of the work. All arrangements such as proper barricading of road, diversion of road if necessary, red and green flags during the day, red lights at nights shall be made by the contractor at his own cost to control and safeguard the traffic.
- 21.9.2 **BITUMINOUS MACADAM OVER WATER BOUND MACADAM :**
- 21.9.3 Preparation of Existing Water Bound Macadam Surface : The existing water bound macadam surface shall be brushed, cleaned properly with wire brushes and coir brooms, so as to free from all loose materials, murrum, earth, silt and caked mud etc. The surface shall then be dusted clean with gunny bags etc. If during the process of cleaning the sub grade (water bound macadam), soft spots and pockets, hollows etc. are found, such spots/pockets will be filled with approved pre-coated bituminous chips, consolidated and finished to proper level, rolled with power roller if necessary. The pot holes shall be excavated properly in a rectangular or rhomboidal shape with vertical edges. The bottom and sides shall be cleaned as stated above. The sides and bottom shall then be thoroughly painted with heated 60/70 penetration bitumen. The pot holes shall thereafter be filled with premixed bituminous chips so that after thorough tamping and rolling, the surface is flush with surrounding road surface all as directed by the Engineer-in-Charge. It shall be the responsibility of the contractor to ensure that the subgrade is even and is finished to camber and slope as shown on the drawings or as directed by the Engineer-in-Charge.
- 21.9.4 The surface of the subgrade shall be checked for its trueness by means of the scratch template resting on side forms having scratch points placed at not less than 200 mm. apart and set to the exact profile of the base course. The template shall be drawn along the forms at right angles to the road.
- 21.9.5 Unevenness of the surfaces as indicated by the scratch points shall not exceed 10 mm. in 30 m. The area of depression shall then be painted or sprayed with 60/70 penetration bitumen at the rate of 0.75 kg. per sqm. and the levelling course applied by hand or machine to grade and camber and rolled. If the depressions are deeper than 50 mm., the levelling course shall be applied in two or more layers and rolled as directed by the Engineer-in- Charge.

- 21.9.6 The prepared surface shall be closed to traffic and maintained fully clean and no asphaltting work shall be started unless this prepared surface is approved by the Engineer-in-Charge.
- 21.9.7 **MATERIALS:** Representative samples of materials proposed to be used shall be submitted to the Engineer-in-Charge and got approved. No material shall be used unless it is approved by the Engineer-in-Charge.

21.9.8 **HOT MIXED HOT LAID BITUMINOUS MACADAM :**

21.9.8.1 **Coarse Aggregate:** It shall consist of crushed hard trap stone metal, free from coatings of clay, silt and any objectionable material. Metal brought by contractor for different items of work shall strictly conform to I.R.C. specifications in all respects. The aggregate shall be obtained by crushing approved stones of specified type in mechanical crusher and shall be hard, close grained, sound trap stone metal, free from decay and weathering and obtained from approved quarries.

21.9.8.1.1 Metal shall be collected in stacks on level ground and neatly stacked at site of mixing. The metal shall be free from all earth, rubbish, vegetation and other foreign matter and graded before stacking and closely packed in stacks.

21.9.8.1.2 Tests considered necessary shall be carried out in an approved laboratory when the Engineer-in-Charge considers the quality to be doubtful or there is a dispute about the quality. The cost of testing shall be borne by the contractor.

AGGREGATE GRADING : The requirements of base course shall be as under:

B.S. Sieve Designation	Equivalent I.S. Sieves	Passing percentage
32 mm. (about 1.25")	40 mm. (1.5")	100
20 mm. (about 3/4")	20 mm.	50 - 100
12 mm. (about 1/2")	12.5 mm.	30 - 60
6 mm. (about 1/4")	6.3 mm.	18 - 30
No. 10	1.7 mm	. 10 - 20
No. 200	75 micron	0 - 5

The aggregate/chips shall be entirely dry at the time of mixing.

21.9.8.2 **Bitumen:** Bitumen to be used shall conform to I.S. 73-1992 for paving bitumen, with 60/70 penetration and shall be from approved manufacturers. The contractor on demand by the Engineer, obtain and furnish a laboratory test certificate to the effect that the material conforming to the requirement of the specified grade, to the satisfaction of the Engineer-in-Charge. Bitumen (60/70 penetration) content 3.7% to 4.7% by weight of the total mix, shall be used in the mixture.

21.9.8.3 **Tack Coat:** Bitumen of the same grade as that used for premix shall be heated to a temperature of 163C to 177C (325F to 350F) in a bitumen boiler and the hot bitumen shall be applied evenly to the thoroughly cleaned and prepared road surface (as specified here-in-before) @ 7.5 kg. per 10 sqm. leaving no part of the surface unpainted. Application shall be done by a mechanical pressure sprayer or if permitted, by perforated pouring cans. The tack coat shall be applied just before the macadam is laid. Application of tack coat shall be only slightly in advance of laying premixed chips. In case of surface already asphalted, application of tack coat is not necessary.

21.9.8.4 **Premixing Chips:** The bitumen shall be heated to 163 C to 177 C (325 F to 350 F) in boiler. The aggregate of the approved grading or as decided by the preliminary tests shall be dried and heated in an aggregate drier to a temperature of 149 C to 177 C (300 F to 350 F) and fed into a twin shaft peddle type mixer at a temperature not less than 149C (about 300F). The bitumen, the approved aggregate and the filler shall be measured separately and accurately to the proportions in which they are to be mixed and mixed intimately till all the particles are completely coated with bitumen. Asphalt/bituminous mixing plant proposed to be used by the contractor for the preparation of Asphalt/bituminous mixing shall conform to all of the requirements of the job, which shall produce uniform mixtures of the required quality, and got approved by the Department before mixing.

21.9.8.5 The temperature of the premix bituminous macadam when leaving the mixer shall not be less than 130C (about 280 F) and it shall not be less than 121 C (about 250 F) at the time of laying.

21.9.8.6 Bituminous macadam shall be transported to site of work in suitable tipping vehicle properly insulated and covered with canvas or other suitable materials to protect the mixture from weather conditions and to retain the heat. The road surface shall be suitably marked to ensure correct and uniform application. Width of macadam to be laid shall be slightly more (not exceeding 50 mm. on each side) than the required carriage way as per

drawing. Excess on either side shall be neatly cut after full compaction to get final width of carriage way as per drawing. The premixed bituminous macadam shall be laid by a mechanical self powered spreader and compactor and finished to correct line, level, & final consolidation done by means of power roller not less than 10 tonne. Any irregularities shall be corrected during rolling.

21.9.8.7 **Compaction:** The base bituminous macadam course shall be compacted thoroughly and evenly with 10 to 12 tonne power roller immediately after it is laid. Compacted thickness shall be as specified in schedule of quantity.

21.9.8.8 The surface shall be checked for correct grade during and after rolling. Any irregularities shall be corrected by adding pre-coated chips or removing the surplus. The disturbed surface shall be well compacted again. If necessary, the roller wheel shall be coated with oil to prevent the coated chip from sticking to the wheels.

21.10 **HOT MIXED HOT LAID BITUMINOUS CONCRETE WEARING COURSE (SEAL COAT) :**

21.10.1 **Bituminous concrete:** shall consist of mixture of mineral aggregate, sand and filler, graded to fill the voids, mixed with bitumen binder to obtain the maximum stability and durability. It shall be spread and compacted on a prepared bituminous macadam base in conformity with lines, grades and cross section shown in the drawings. The aggregate shall be preheated the temperature specified for the bitumen and the mixture shall be prepared and laid hot.

21.10.2 **Coarse Aggregate:** The coarse aggregate brought by contractor shall be I.R.C. hard black trap, crushed in mechanical crushers and shall be clean, strong, tough, dense, close grained, angular but not flaky, and free from soft, decayed, weathered portion, coating of dust, dirt or other objectionable matter. Maximum size of the aggregate shall be suitable for the thickness of the seal coat (12mm./15mm. or as specified). The aggregate grading composition and characteristics of surface (wearing course mix) shall conform to standard code of practice. The mix shall satisfy the following requirements:

Bitumen :	7.25 (+/-) 0.25% by weight of total mix.
Voids of air in total mix :	2% by weight of mix and 4% by volume.
Specific gravity	Not less than 2.3.
Marshall stability :	453.6 kg (1000 lb.) minimum
Flow :	1020.
Water absorption :	0.50%

21.10.3 **Fine Aggregate:** The fine aggregate shall be clean, natural, river bank or pit sand or quarry sand produced in a crushing plant and satisfying the requirement of the grading of aggregate for the bituminous concrete as stated above or as determined by the preliminary tests.

21.10.4 **Filler:** The filler shall be dry and clean lime stone powder hydrated lime having calcium oxide content of not less than 60% both passing B.S. sieve No.8. It shall be free from lumps and loosely bonded aggregation. When tested by laboratory sieves, 100% shall pass through B.S. sieve No.14, 80% shall pass through B.S. sieve No.8. Fillers shall be added to the aggregate to give the above grading determined by preliminary tests.

21.10.5 **Bitumen:** Bitumen shall be of 60/70 penetration or such other grade specified by the Engineer-in- Charge and shall conform to I.S. 73-1 961. The tenderers shall indicate the exact grading, bitumen content, voids, specific gravity etc. which they propose to adopt for type to treatment offered by them.

21.10.6 Preparation of Base : Dirt, dust and other foreign materials if accumulated shall be cleared off leaving the surface entirely clean. The prepared surface shall be closed to traffic and so maintained fully clean till the seal coat is applied.

21.10.7 **Mixing and Laying Wearing Course :** Grade 60/70 bitumen shall be heated to a temperature of 163 C to 177 C (325 F to 350 F) in a boiler. The aggregate of the suitable approved grading or as decided by preliminary tests, shall be dried and heated in an aggregate drier to a temperature of 149 C to 177 C (300 F to 350 F) and fed into a twin shaft peddle type mixer at a temperature not less than 149 C (300 F). The bitumen, the aggregate and the filler shall be measured separately and accurately to the proportions in which they are to be mixed and mixed intimately till all the particles are completely coated with bitumen. The quantities of aggregate, bitumen and the filler shall be such as to obtain the percentage of each as specified above or decided after tests. Continues batching and mixing plant shall be used. Asphalt/bituminous mixing plant proposed to be used by the contractor for the preparation of asphalt/bituminous mixes shall conform to all of the requirements of the job, which shall produce uniform mixtures of the required quality.

21.10.8 The temperature of bituminous concrete when leaving the mixer shall not be less than 138 C (280 F) and it shall not be less than 121 C (250 F) at the time of laying.

- 21.10.9 The bituminous concrete shall be transported to the site of work in suitable tipping vehicles properly insulated and covered with canvas or other suitable materials to protect the mixture from weather conditions and to retain the heat.
- 21.10.10 The mixture shall be spread with mechanical self-powered spreader. The bituminous concrete shall be laid to the specified line, curve, grade and camber. Any irregularities shall be corrected immediately before rolling is started. Before laying the mixture, the faces of the joints shall be painted with a uniform coating of hot bitumen. The bituminous concrete shall be laid to such loose depth as to give a compacted layer of specified thickness as per item in the schedule of quantities.
- 21.10.11 **Compaction:** The bituminous concrete layers shall then be allowed to cool sufficiently such that it does not spread under wheel load of 10/12 tonne power roller. The compaction shall be done by the roller till no wheel mark are left on the surface and no further compaction is possible. The road shall be opened to traffic on cooling of the concrete to the atmospheric temperature.
- 21.10.12 **GENERAL REQUIREMENTS FOR BITUMEN MACADAM & SEAL COAT:**
- 21.10.12.1 **Testing :** The contractor shall have a well-equipped testing laboratory with a competent laboratory staff. Daily tests (not less than two specimen per day) shall be made by them on the bituminous mixture produced to ensure compliance with these specification and copy of the test results duly signed by the competent authority shall be submitted to Engineer-in- Charge for record. Tests shall include water absorption, stability, filler content etc.or after a lapse of 24 to 40 hr. after laying. The contractor shall give all facilities at all times to the Engineer-in-Charge or his representative to inspect the work or testing done by him.
- 21.10.12.2 **Weighing :** Each lorry leaving the plant must be weighed on a weigh bridge in the presence of the representative of the Department and a challan must be issued along with the lorry in duplicate showing the weight of the material loaded in the lorry. As and when required, the said lorries shall also be weighed at the Departments weigh bridge or any other weigh bridge approved by the Engineer-in-Charge to check the tonnage of the material stated on the challans. In case of short fall, the same shall be made good by the contractor without extra cost.
- 21.10.12.3 **Testing Surface :** The completed surface when ready for acceptance shall be thoroughly compacted, smooth, true to line, grade, camber and free from irregularities when tested by means of a straight edge of 3 m. long, laid on the finished surface parallel with the centre line of the road, the surface shall in no place vary more than 6mm. from the working edge.
- 21.10.12.4 **MODE OF MEASUREMENT :**
- 21.10.12.4.1 Measurement for bituminous macadam including filling in pot holes and depressions shall be paid by weight measured in metric tonne used on the job, completed satisfactorily, measured upto second place of decimal including preparing surface, applying tack coat and compacting by roller etc. complete as specified. Measurement for bituminous concrete (seal coat) shall also be paid by weight as measured at site of work, irrespective of the thickness laid, in Metric tonne used on the job, compacted satisfactorily, measured upto second place of decimal including all the relevant items of work specified.

22 . **ALUMINIUM WINDOWS, VENTILATORS, COMPOSITE UNIT ETC.**

- 22.1 **SCOPE OF WORK :** The scope of work in the tender item includes fabrication, supply and installation of white anodised matt finished aluminium windows, ventilators, composite units, glazing etc. strictly in accordance with these specifications and relevant detailed approved shop drawings.
- 22.2 **GENERAL :** The material, fabrication and hardware shall conform to IS 1948 & 1949. The contractor shall submit six copies of shop drawings covering all types/details of work as generally shown in Architectural drawing and envisaged under these specifications before manufacture. The drawing shall show all dimensions, details of construction, installation, fixtures and relation to adjoining and related works. No fabrication work shall be under- taken prior to the approval of the shop drgs. from the Engineer-in- Charge. The tenderer shall intimate at the time of tendering, the types of sections he proposes to use on the works.
- 22.3 **MATERIALS :** The aluminium alloy used in the manufacture for extruded window section shall correspond to I.S. 733 (or any further revision thereof). Extruded sections shall conform to I.S. designation HE9-WP and Hollow sections shall conform to I.S. Designation HV9-WP. The frame work, stiles, mullions, beadings, transoms, hinges, pegstays, handles etc. shall be of aluminium anodised

sections as shown in the detailed drawings. All sections and hardware shall have minimum anodic film thickness of 0.015 mm. All sections shall be of INDAL or other equivalent make as per drg. The contractor can also propose nearest alternative sections they manufacture/posses without changing the elevations and functional requirements. Department reserves the right to accept the alternative sections or otherwise. The sections shall be structurally suitable to withstand all the load, the members have to sustain. Countersunk screws, nuts, bolts, washers, rivets and other miscellaneous fastening devices shall be of approved cadmium plated or stainless steel as specified in the approved drawings.

- 22.4 **FABRICATION** : The frames shall be manufactured square and flat. The corners of the frames shall be fabricated to true right angles. All the fixed, sliding, openable frames shall be constructed from sections which have been cut to length, mitred and mechanically jointed or welded at the corners. Where hollow sections are used with welded joints, argon arc welding or flash butt welding shall be employed (Gas welding or brazing not to be done). Sub-dividing bars of units shall be tenoned and rivetted into the frames. In case welded joints are used, all welding shall be on unexposed sides in order to prevent pitting, discolouration and other surface imperfections after finishing. The dimensions shown in the drawing are overall heights and widths to the outside of frames of aluminium windows. The side hung shutters shall have projected friction type hinges of aluminium alloy. Concealed projected hinges having structural stability and of good quality will also be considered only after the inspection of the sample submitted by the tenderer. The necessary pegstays, handles, window fasteners etc. shall be of aluminium. The handle shall be mounted on a handle plate rivetted to the opening frame. The pegstays shall be 300 mm. long or as required complete with peg and locking bracket and shall have holes for keeping the shutter open in three different positions. No field fabrication of frames is permitted. The complete fabricated assembly shall be anodised in approved satin finish with minimum film thickness of 0.0 15 mm. for the entire surface. A thick layer of clear transparent lacquer based on methacrylate or cellulose butyrate shall be applied on the finished sections of the aluminium windows etc. by the supplier to protect the surfaces from wet cement, lime, dirt, dust etc. during the installation. This lacquer coating shall be removed after installation is complete, if approved by the Engineer-in-Charge and all sections of the windows shall be protected by P.V.C. film covering.
- 22.5 **HARDWARE**: All cut outs, recesses, mortising or milling and operations required for fixing the hardware shall be accurately made, reinforced with packing plate as required to ensure adequate strength of the connection. All the hardware, accessories shall be of best approved type and of anodised finish same as for the frame and other sections. All hardware shall be free from defects which may affect the appearance and serviceability. All hardware shall be fixed after obtaining the prior approval of the Engineer-in-Charge. Approved samples of hardware shall be kept in the custody of Engineer-in- Charge.
- 22.6 **FIXING** : The window frames shall be accurately fixed in the brick masonry or R.C.C. work. The fixing of the frame shall be done with cadmium plated brass counter sunk screws driven on the teak wood rough grounds if required or fixed to the wall with holdfasts. All aluminium windows shall be fixed in position as per I.S. 1081-1960 (or any revision thereof): Code of practice for fixing and glazing of aluminium windows. All joints between metal and masonry/rough ground wooden frame shall be fully caulked with mastic or polysulphide compound in order to ensure water tight joints. Joints shall be neatly painted with matching cement and excess materials shall be removed. Hardware shall be fixed in workman like manner all as directed by the Engineer-in-Charge.

- 22.7 **SAMPLES** : The samples of different windows shall be submitted to the Engineer-in-charge, for approval.
- 22.8 **GLAZING** : The glazing shall be of Indian make plain sheet/frosted figured glass of special selected quality and size as mentioned in item description and drawings and shall be of M/S. Triveni/Shree Vallabh/I.A.G. or other approved equivalent. The specifications specified here-in-before shall hold good as far as applicable.
- 22.9. **MODE OF MEASUREMENT**: Shall be per m² and kgs.
- 22.10. **GUARANTEE**: All materials and workmanship in above work shall be guaranteed for a period of one year (unless otherwise specified) from the date of handing over the work. Unqualified performance guarantee for smooth operation of the windows, doors, wall spans and precautionary measures against leakages etc. shall be furnished by the contractor on stamped paper, if so specified in schedule of quantities. Any defect found during the guarantee period shall be replaced/made good to the original conditions/positions entirely at the cost of the contractor.
- 22.11. **TESTING**: All windows shall be tested for water tightness. Any leakage found during testing shall be rectified by the contractor without any extra charge.

23 **Cast iron Railings/ Boundary Walls**

23.1 Shall conform to IS 210: 2009 Grey Iron Castings

23.2 **SCOPE** This standard covers the requirements for grey iron castings

23.3 **REFERENCES**

23.3.1 **SUPPLY OF MATERIAL**

GRADES There shall be seven grades of grey iron castings General requirements relating to the supply of grey iron castings shall be as laid down in IS 1387. namely, grades FG 150, FG 200 , FG 220, FG 260 , FG 300, FG 350 and FG 400 . The designation system for grey cast iron is given in IS 4843 .

23.3.2 **MANUFACTURE** The castings shall be made by any process, as agreed between the supplier and the purchaser that will produce castings complying with the requirements of this standard and shall be in accordance with the pattern or working drawing as supplied by the purchaser.

23.3.3 **CHEMICAL COMPOSITION** The composition of cast iron shall be left to the discretion of the manufacturer, but a maximum limit for phosphorus and/or sulphur may be specified by the purchaser, if he so desires.

In case of special castings, the detailed chemical composition shall be as agreed to between the purchaser and the manufacturer.

23.3.4 **WORKMANSHIP AND FINISH**

The castings shall be accurately moulded in accordance with the pattern or working drawings supplied by the purchaser, with the addition of such letters, figures or marks as may be specified.

The purchaser shall specify tolerances, machining location and allowances with reference to all important dimensions. On other dimensions tolerances specified in IS 5519 shall apply.

23.3.5 **MICROSTRUCTURE**

Where so required, the microstructure of grey iron castings and the location for taking the sample shall be as agreed to between the purchaser and the manufacturer.

Unless otherwise specified, the microstructure shall be substantially free of primary cementite and/ or massive steady state and shall consist of Flake graphite in a matrix of ferrite or pearlite or mixture thereof. Unless otherwise specified, the graphite structure shall be primarily Distribution A in accordance with IS 7754.

23.3.6 **WELDING** It is important to note that welding of cast iron with mild steel and to itself has standard set of welding specifications with respect to choice of electrodes and the same shall be strictly followed. Guidelines as per IS 5511:1991(Reaff. 2003) shall be strictly followed. It is also advised that a sample weld between

- a) Cast Iron to Cast Iron
- b) Cast Iron to Mild Steel

is done at site and test performed before final assembly / procurement of Railings.

23.4 **MEASUREMENT** Shall be as per weight.

24 **STANDARD SPECIFICATIONS**

Unless otherwise specified elsewhere in this contract, all work under this contract shall be carried out in accordance with the technical specification and the latest issue of the Indian Standard Specification applicable to the particular class of work. If Indian Standards are not formulated for any particular material of work, the relevant British Standard Specification shall apply. Relevant issue of I.S. specifications applicable to the particular work have been described along with the specification for the respective works. In case of any confusion or dispute regarding the meaning and interpretation of any specification for the respective works, the decision of the Procuring Entity/Architects shall be final and binding on the contractor.

PART – C
ELECTRICAL

TECHNICAL SPECIFICATIONS FOR ELECTRICAL WORKS

TS 1 SUBSTATION

TS 2 CONDUIT WIRING

TS 3 L.T. PANEL

TS 4 CABLING, TRAYS & TRUNKING

TS 5 LIGHTING FIXTURES

TS 6 EARTHING

TS 7 TELEPHONE SYSTEM

TS 8 ANALOGUE ADDRESSABLE FIRE ALARM SYSTEM

TS 9 FIRE EXIT ALARM SYSTEM

TS 10 CENTRAL CHANNEL MUSIC CUM PAGING SYSTEM

TS 11 D.G. SET

TS 12 MATV SYSTEM

TS 13 LIGHTNING PROTECTION

TS 14 EXTERNAL LIGHTING

TS 15 UNINTERRUPTED POWER SUPPLY SYSTEM

TS 16 VOLTAGE STABILIZER

TS 17 T.V. INSTALLATION

TS 18 CCTV

TS 19 MCB DISTRIBUTION BOARD

TS 20 OUTDOOR SUBSTATION

TS 21 TRANSFORMER

TS 22 BATTERY AND BATTERY CHARGER

TS 23 : COMPACT SUBSTATION

LIST OF APPROVED MAKES

TS 1 : SUBSTATION

1.0 H.T. BREAKER :

1.1 11 KV VACUUM CIRCUIT BREAKER

1.1.1 SCOPE

Manufacturing, testing and supplying of integrated cubicle type floor mounted free standing sheet steel enclosed, front operated indoor type 11 KV Vacuum Circuit Breaker Panel as per specifications given below :

The metal enclosed panel shall be made from MS sheet steel 2 mm thick and shall be folded and braced as necessary to provide a rigid support for all components and shall be compartmentalized with internal partitioning with insulated material (epoxy reinforced fibre glass) to give :

- I. Circuit Breaker Compartment.
- II. Bus Bar Compartment.
- III. CT and Cable Compartment.

A separate LT chamber for fixing of necessary instruments, metering and protective equipment shall also be provided.

1.1.2 BREAKER COMPARTMENT

Vacuum Circuit Breaker shall be mounted in draw out truck with front plate which covers the cubicle when the breaker is in service position. This front plate shall be provided with view glass to facilitate observation of mechanical ON/OFF indication of Circuit Breaker, Spring charged/discharged indication and operation counter. Necessary orifice shall be provided for manual charging of the springs. ON/OFF push button for opening and closing of the circuit breaker shall also be provided. The draw out track shall have two positions for the circuit breaker VIZ isolated / Test & Service.

1.1.3 BUS BAR COMPARTMENT :

Bus bars of rectangular cross section of copper conductor supported by cast epoxy insulator to withstand full short circuit currents upto 44 KA for three seconds shall be provided at the rear.

1.1.4 CT AND CABLE COMPARTMENT :

At the rear of the panel sufficient space shall be available to accommodate three numbers epoxy CT of double or triple core and two numbers three core or six numbers single core cable termination. The cable entry shall be from the top / bottom.

1.1.5 LT CHAMBER :

LT Chamber with hinged door shall be provided on top of the breaker chamber to house the protection relay, meters and remote control equipment.

1.1.6 CABLE EARTHING :

Cable earthing switch shall be provided in the cable chamber and shall be operated from the front of the panel. The ON/OFF position of switch shall be indicated by mechanical indicator. The earthing switch shall be suitably interlocked with the breaker, so that it can be operated only when the breaker is in OFF position.

1.1.7 ISOLATING CONTACTS :

The breaker isolating contacts shall consist of two parallel flat silver plated copper bars with ball point contacts to give a vertical tolerance of +/- 10mm.

1.1.8 LOW VOLTAGE PLUG AND SOCKET CONNECTOR :

A twenty pin plug and socket connection along with flexible leads shall be provided to connect control instrumentation and inter lock circuits on the breaker truck and in the panel. The plug and socket assembly shall be suitably interlocked with the truck positions like service and test / isolated position.

1.1.9 INTERLOCKS AND SAFETY DEVICES :

The following interlocks shall be provided :

- a. The truck cannot be moved from either test to service position or vice versa, when the circuit breaker is 'ON'.
- b. The circuit breaker can not be switched 'ON' when the truck is in any position between test and service position.
- c. Front part of the truck can not be removed when the breaker in 'ON' position.
- d. The low voltage plug and socket can not be disconnected in any position except test / isolated position.
- e. The truck can not be moved inside the panel, when the LT plug and socket is disconnected.
- f. Earthing switch can not be switched 'ON' when the truck is inside the panel.
- g. The truck can not be inserted when the earthing switch is 'ON'.

1.1.10 SAFETY DEVICES :

The following safety devices shall be provided for the safety of the operating personnel

- a. Individual explosion vents shall be provided for breaker / bus bar / cable chambers on the top of the panel to let out the gases under pressure generated in case of fault inside the panel.
- b. Cubicle with front plate to withstand the pressure for internal arc fault as per PEHLA recommendation.
- c. Circuit Breaker and sheet metal enclosure shall be fully earthed.
- d. Self locking shutters shall be provided which shall close automatically when the truck is withdrawn to 'Test Position' and no separate padlocking of the shutter shall be required

1.1.11 PROTECTIVE EARTHING :

The earthing connection between the truck and the cubicle shall be by means of sliding contacts so that the truck is earthed in the isolated position when inserted and remains earthed when truck is pushed further into the connected position or when the truck is being withdrawn until the truck has moved part the isolated position.

1.1.12 CURRENT TRANSFORMER :

I. GENERAL REQUIREMENTS :

Accommodation shall be provided in the circuit breaker panel, to mount one set of dual ratio CT. Access to the CTS for cleaning, testing or changing shall be from the front, back or top of the panel.

II RATING :

Dual ratio CTS of suitable burden (but each not less than 15 VA) shall be preferred with 5 amps secondaries.

The CTs shall conform to relevant Indian Standards. The design and construction shall be dry type, epoxy resin cast robust to withstand thermal and dynamic stresses during short circuits. Secondary terminals of CTS shall be brought out suitable to a terminal block which will be easily accessible for testing and terminal connections. The protection CTS shall be of accuracy class 5 P 10 of IS 2705 - Part III - 1992.

1.1.13 POTENTIAL TRANSFORMER :

I GENERAL REQUIREMENTS :

A potential transformer of burden not less than 100 VA and of proper ratio as specified, shall be provided at the incoming panel. The accuracy class for PT shall be class I as per IS-2705 1992 parts I to III.

1.1.14 PROTECTION AND TRIPPING ARRANGEMENT :

I. PROTECTION :The protection and tripping arrangement of circuit breaker shall be :

- a. Two O/C element IDMTL relays with High instantaneous setting with separate earth fault relay series Trip / Shunt Trip on 24V/30V/ operating off D.C. supply.
- b. Lockout and trip supervisory relays etc. shall be provided.
- c. Auxiliary relay for transformer fault.

II RELAYS :

Over current Relays shall have adjustable setting for current from 50% to 200% and earth fault from 10% to 40%.The IDMT relays shall have 10/1 characteristics. They should be of manual reset type. All relays shall have a flag indicator which will indicate operation for each function. It shall be possible to reset it only by manual operation. The number and types of relays shall be specified.

1.1.15 CONTROL WIRING :

The control wiring shall be carried out with minimum 2.5 sq.mm. PVC insulated copper conductor cables. The wiring shall be securely fixed and neatly arranged to enable easy tracing of wires. Identification PVC ferrules shall be fitted to all wire terminals to render easy identification and facilitate

checking in accordance with IS 5578 and 11353.

1.1.16 METERING INSTRUMENT PANEL ACCESSORIES :

I. METERING :

Digital type Trivector meter shall be provided on incomer feeder.

II INSTRUMENT PANELS :

The instrument panel shall be part of the housing. Relays, meters and instruments shall be mounted as per general arrangement drawings to be submitted by the vendors. They shall be of flush mounting type.

III. INSTRUMENTATIONS :

- a) Digital type Voltmeter of class 1.0 accuracy and 96 x 96 mm square in size as per IS - 1248 shall be provided at each incomer pane, with selector switch. The instrument shall be calibrated for the ranges specified.
- b) Digital type Power factor meter of class of 1.0 accuracy conforming to IS:1248 shall be provided at each incomer panel.
- c) Digital type Ammeter of specified range to class 1.0 accuracy and 96 x 96 sq.mm. in size as per IS - 1248 shall be provided at both incomer and outgoing panels along with necessary selector switches.
- d) Digital type frequency meter class of 1.0 accuracy conforming to IS : 1248 shall be provided at each incomer panel.
 - Lamp indication shall be provided to indicate ON/OFF (By red / green respectively) of switch gear.
 - Trip Circuit Healthy supply shall be indicated by clear lamp.
 - Separate MCB's shall be provided for lamps, heaters, voltmeters and other instrumentation etc. on each panel.
 - Anti- condensation space heaters suitable for operation on 240 V single phase, 50 Hz. A.C. for each panel and supply of control equipment for the above shall be by the vendors.
 - Where there is more than one incomer and bus sections, these sections shall be mechanically and electrically interlocked as per interlocking scheme.

2.0 BATTERY CHARGER UNIT :

2.1 Battery Charger unit shall be provided with "Boost Charging" and Flout Charging" suitable for 240 Volts single phase, AC, 50 Hz supply system.

2.2 CONSTRUCTION FEATURE :

Housing of battery charger shall be of 2 mm thick steel cabiner for indoor installation and shall be floor mounted type. The cabinet shall be folded and braced as necessary to provide a rigid support for all components. Louvers shall be provided in the cabinet for ventilation PVC sheet of 3 mm thickness shall be provided on the shelves on which the batteries are to be placed.

2.3 INPUT VOLTAGE :

240 Volts, AC, 40 cycles single phase with tapplings of 0-200-220-240 volts on the transformer primary.

2.4 OUTPUT :

DC output voltage of the battery charger shall be suitable for charging 24 volts maintenance free batteries of 200 AH capacity in the following rnage.

Trickle charger 150-500 mA at 2.0-2.3 volts per cell.

Quick charger 25.0 A at 1.85-2/75 volts per cell.

Battery charger shall be provided with AC input ON/OFF Rotary Switch. Indicating lamp to indicate that the charger in ON. Potentio for Trickle / Boost charging control. Transformer shall have tapplings in the secondary for adjusting the Boost charge current. Bridge rectifier shall be silicon type, having full wave Bridge configuration.

3.0 SAFETY EQUIPEMENTS :

3.1 DANGER PLATE :

Danger plate shall be provided on HV and MV equipment. MV danger notice plate shall be 200 mm x 150 mm made of mild steel atleast 2 mm thick vitreous enamelled white on both side and with inscription in red colour on front side.

3.2 FIRE EXTINGUISHERS :

Potable CO2 conforming to IS : 2878 - 1976, and dry chemical conforming to IS : 2171 - 1967 shall be provided in the Sub-station.

4.0 DRAWINGS / DOCUMENTS REQUIRED FOR REVIEW / APPROVAL :

Following drawings documents shall be submitted by the manufacturer for approval.

- a) General arrangement (GA) of equipment layout.
- b) Equipment list.
- c) Relay and metering system schematics.
- d) Supply and erection schedule.
- e) Catalogue and specification sheets.

5.0 INSPECTION AND TESTING :

After manufacturing of switchgear panels tests shall be carried out on the equipment as per relevant IS and Electricity Regulations.

6.0 QUALITY ASSURANCE :

Vendor shall submit in substantial detail a quality assurance plan indicating all activities step by step at various manufacturing / fabrication stages to meet the requirement of this specification and various standards / regulations / practices to enable comprehensive assessment of its merits and reliability.

7.0 TECHNICAL DATA FOR SWITCHGEAR CUBICLE TYPE & VCB / SF6 CIRCUIT BREAKER :

7.1 TENDERER MUST FILL IN THE FOLLOWING TECHNICAL DATA SWITCHGEAR CUBICLE VCB BREAKER

- i. Make
- ii. Type
- iii. Reference
- iv. Voltage (System / Rated)
- v. Phase / Frequency
- vi. Short Circuit Rating
 - a. Interrupting Symmetrical
 - b. Short time for ½ sec.

7.2 CONSTRUCTION :

- i. Drawout feature for Circuit Breaker with Service Test & Disconnected.
- ii. Minimum clear space required at :
 - a. Front for breaker withdrawl.
 - b. Rear.

7.3 BUS BAR :

- i. Material & grade
- ii. Reference standard
- iii. Cross sectional area size.
- iv. Continuous current at 40 deg. C.
- v. Max temp rise over for 40 deg. C.
- vi. Short time current for 1/3 sec.
- vii. Min clearance of bare bus bar & connection
 - a. Phase to phase
 - b. Phase to ground

7.4 CIRCUIT BREAKER VCB BREAKER

- i. Make
- ii. Type
- iii. Rated voltage
- iv. Rated frequency
- v. No. of poles
- vi. Rated current
 - a. Continuous at 40 deg. C & within cubicle

- b. Short time current for 1 sec / 3 sec.
- 7.5 Max. temp rise over 40 deg. C ambient.
- 7.6 Rated operating duty.
- 7.7 Interrupting capacity at rated voltage and operating duty
 - a. Symmetrical
- 7.8 Rated making current.
- 7.9 Type of contacts
 - a. Main
 - b. Arcing
- 7.10 Min clearance in air
 - a. Between poles
 - b. Between live parts & ground
- 7.11 Operating mechanism
 - a. Type
 - b. No. of breaker operations stored
 - c. Trip free or fixed trip?
 - d. Antipumping features provided
- 7.12 Closing Coil
 - a. Voltage
 - b. Permissible voltage variation
 - c. Power required at rated voltage
- 7.13 Breaker / breaker cubicle provided with the following :
 - a. Mech. Safety interlocks
 - b. Automatic safety shutter
 - c. Emergency manual trip
 - d. Mech. ON/OFF indicator
 - e. Operation counter
 - f. Spring charge / discharge indications
 - g. Manual spring charging facility
 - h. Mechanical Antipumping
- 7.14 Net weight of the breaker
- 7.15 Impact load for foundation design
- 7.16 Overall dimensions in mm.
- 8.0 RUBBER MATTING :

Rubber matting shall be provided in front of H.V., M.V. Panels and capacitor banks for the full length of panel. 15 mm thick rubber matting of an approved make over a 100 mm high timber platform shall be provided in front of the full length of switchboard to cover the operating area and to avoid danger, of electric shock during operation of the switchgear. The width of rubber matting shall be 1000 mm. The mats shall withstand 45 KV for one minute and leakage of current shall not exceed 160 mill amps. Per square meter.

TS 2 : CONDUIT WIRING :

1.0 GENERAL :

All work shall be carried out as per I.E Act 1910 , Rules 1956, IS Specifications and Local Supply Authority.

All Materials to be used in the installation shall conform to Indian Standard Specifications (wherever they exist).

Good Workmanship is an essential requirement for Contract and the work shall be carried out under the direct supervision of a person competent for the purpose.

2.0 CONDUITS WORK :

Conduit wiring shall be with M.S. Conduit as per the Bill Of Quantities.

2.2.1 M.S. CONDUITS :

The M.S. Conduiting for Lighting, Small Power and Computer Power Points shall be carried out with ISI marked, Heavy Gauge, E.R.W. M.S. Conduits black enameled inside & outside and with minimum wall thickness of 1.6 mm.

The conduits shall be delivered to construction site in original bundles and each length of the conduit shall bear the labile of the manufacturer. The conduits shall be free of burrs or damages.

The conduits shall be clamped by G.I. saddles of minimum 20 gauge or by clamps fabricated from M.S. strips of minimum 25 mm x 3 mm. The M.S. clamps/supports shall be duly painted with 2 coats of red oxide and 2 coats of black enameled paint.

The clamps/supports shall be fixed to the underside of the ceiling by means of nylon Rawal Plugs and brass screws of 3 mm size. Anchor fasteners of suitable sizes shall be provided if necessary

The conduits shall be supported at regular intervals of 1000 mm. Additional supports shall be provided on either side of bends & termination's.

Junction boxes of suitable sizes fabricated from 16 gauge M.S. Sheets, with covers fixed by means of brass screws and painted with 2 coats of red oxide and 2 coats of grey enameled paint shall be provided at convenient locations for inspection & pulling of wires.

The conduits shall be bent with a bending machine to provide smooth bends. The use of readymade bends shall be kept to a minimum.

Conduit connections shall be screwed metal to metal & painted with enamel paint. Threads & Sockets shall be free of grease & oil before painting. Connections between screwed conduits & sheet metal

boxes shall be by means of a smooth bore brush fixed to the box with check nuts inside & outside the box and connected through a coupler to the conduit.

Joints of conduits shall be free of burrs and shall avoid damage to the insulation of wires. Connections between PVC & M.S. Conduits shall be through M.S. Junctions boxes only. Direct connections between PVC & M.S. Conduits are not allowed.

Minimum size of conduits used shall be 20 mm diameter.

2.2 PVC CONDUITS :-

Heavy gauge rigid PVC conduits conforming to IS-2509 of 1973 shall be used for wiring. Minimum size of conduits used shall be 20 mm dia and they shall be delivered to the construction site in packed bundles bearing manufacturer's labels.

The fixing/clamping of conduits shall be as per the 3rd, 4th & 5th paragraphs of M.S. conduits (above) except that the conduits shall be supported at regular intervals of 500 mm.

Junction/pull boxes shall be provided as specified in the 6th paragraph of M.S. conduits (above).

The conduits shall be bent with bending springs to provide smooth bends. Use of readymade bends shall be kept to a minimum.

The jointing of PVC conduits shall be done with couplers and PVC solvent cement. Conduits to be terminated in M.S. Boxes shall be terminated with female adopters with bushes.

All conduits assembled (PVC & M.S.) without wiring shall be provided with G.I. pull of minimum, 14 gauge.

2.3 SWITCH BOXES :-

Switch boxes shall be either (i) flush type zinc coated M.S. boxes with adjustable lugs to be used flush in brick masonry walls or (ii) surface mounting type M.S. boxes fabricated from 16 gauge M.S. sheets and painted with 2 coats of red oxide & 2 coats of synthetic enamel paint to be used in timber partitions/furniture or on walls/columns. All boxes shall have brass earthing terminals and suitable knockouts shall be provided in the sides for conduits entries.

2.4 WIRING :-

Wires Sizes :

Wiring for lighting and small power & computer power shall be carried out with stranded copper conductor. 650/1100V grade PVC wires conforming to IS-694 in the following sizes:-

- 1.5 sq.mm. (3/0.80 mm)
- 2.5 sq.mm. (3/1/04 mm)
- 4.0 sq.mm. (7/0.85 mm)
- 6.0 sq.mm. (7/1.04 mm)
- 10.0 sq.mm. (7/1.35 mm)
- 16.0 sq.mm. (7/1.70 mm)

The wiring for Computer Power Outlets shall be carried out with 3 core Copper PVC Insulated PVC sheathed flexible wire of 650 V grade.

COLOUR CODE :-

A uniform color code shall be maintained for the entire wiring installation as follows :-

Red, Yellow & Blue for the respective Phases, Black for Neutral and Green for earthing.

2.5 EARTHING WIRES :-

Green PVC Insulated earthing wires of 2.5 sq.mm. size shall be used for lighting & 5A socket outlets, 15A socket outlets and single phase A.C. Power.

2.6 NUMBER OF WIRES IN CONDUITS :-

Wire Size : Maximum number of wires in conduits of size.

in sq.mm.	20 mm	25 mm	32 mm	40 mm
1.5	5	10	-	-
2.5	5	8	-	-
4.0	3	6	-	-
6.0	2	4	8	-
10.0	-	3	5	6
16.0	-	-	3	5

2.7 BUNCHING OF WIRES :-

Current carrying wires shall be bunched that the outgoing & return wires are drawn into the same conduit. Wires of two different phases shall be not run in the same conduit. Circuit wiring for lighting & power shall be in separate conduits.

2.8 JOINTING OF WIRES :-

All joints shall be made at switches, socket outlets & lighting fixtures only. No joints shall be allowed in conduits & junction boxes.

2.9 WIRING ACCESSORIES :-

The lighting control switches, switched socket outlets, sockets & DP switches shall be Plate or Arch Type as per the Bill of Quantities and as approved by the Consultants. The switches shall have silver contacts.

TS 3 : SPECIFICATIONS FOR L.T. PANELS

1.0 SCOPE :

The scope of this specifications covers manufacture, supply, installation, testing and commissioning of indoor MV Switchboards and HRC fuse Distribution Boards.

2.0 STANDARDS :

The following Indian Standards shall be applicable :-

IS 4237 of 1967	:	General requirements for switchgear and control gear for voltage not exceeding 1000 Volts.
IS 2516 (Part I) Sec. I 1965	:	A.C. Circuit Breakers.
IS 4064 - 1978	:	Heavy Duty Air Break Switches for voltage not exceeding 1000Volts.
IS 2147 - 1962	:	Degree of protection Provided by enclosure for low voltage switchgear and control gear.
IS 3202 - 1965	:	Code of practice for Climate proofing of electrical equipment.
IS 722 - 1977	:	A.C. Electric Meters.
IS 2705 - 1964	:	Current Transformers(Part 1 to 4)
IS 9224 - 1979	:	HRC fuse upto 650 V.
IS 649 - 19	:	PVC insulated cables Upto 1100V.
IS 8263 - 19	:	Factory built assemblies of switchgear and controlgear.
IS 3072 – 1965	:	Code of practice for Installation & Maintenance of switchgear
IS 3231 – 1965	:	Electrical relays for Power System protection
IS 2516 – 1967	:	Moulded case Circuit Breakers.

3.0 CONSTRUCTION :

The salient feature of construction of panels shall be as follows :-

- a) Sheet Steel : 2 mm thick for frames, cable glands plates and equipment mounting plates and 1.6 mm thick for front and rear doors and covers.
- b) Welded construction, with shipping section bolted together. All such joints to be gasketed. Lifting lugs to be provided.
- c) The cubicles shall be totally dust and vermin proof conforming to IP 54 IS 2147.
- d) The doors to be hinged type except busbar chamber covers which shall be bolted type. The panel shall be of flush front design, suitable for access from front and rear.
- e) The construction shall be such as to facilitate easy extension at both ends.
- f) The design shall be such as to have individual feeders in separate compartments, with proper barriers between adjacent feeders, busbar chamber and cable box chambers.

4.0 PAINTING :

All sheet steel work shall be cleaned and degreased. Rust and scale shall be removed by pickling and phosphatising. After phosphatising, two coats of primer shall be applied followed by two coats of finishing synthetic enamel paint of approved shade as per IS-5. The painting shall be stove enameled.

5.0 AIR CIRCUIT BREAKERS :

The circuit breaker shall be air-break, horizontal draw-out feature shall show 3 positions viz; SERVICE,

TEST and ISOLATE. These positions alongwith `OPEN' and `CLOSE' positions shall be visibly marked. All positions shall have provisions for locking. The ACB shall have shutter assembly and arc-chutes and mechanical trip features.

The ACB shall have 6 NO + 5 NC auxiliary contacts rated at 10A, 240 V, AC. `RED' and `GREEN' indicating lamps shall be provided on the cubicle.

The ACB door shall not have any lamps or instruments. All such accessories shall be mounted on a separate compartment. The ACB shall have proper interlocks such that it cannot be plugged in or out `SERVICE' position, if the breaker is in `ON' condition. It shall not be possible to operate as circuit breaker unless it is properly engaged in any of the three positions.

The ACB shall have series CT operated over-current and short-circuit releases with facilities to mount the under voltage and shunt-trip releases. The operating mechanics shall be independent, manual spring charged stored energy type. The mechanism shall ensure quick-break, quick make action and the ACB shall be trip-free in operation.

6.0 AIR BREAK SWITCHES :

The air break switches shall be of AC 23, (heavy) duty quick make-quick break, fault -make type as per IS 4047. The contacts shall be silver plated.

The switches shall be capable of with standing the mechanical and thermal stresses produced by overloads and short circuits.

All switches of all ratings shall have interlocks with the compartment doors. Switches shall be lockable in the `OFF' position. All live parts shall be shrouded. It shall be possible to intentionally defect the interlocks if required.

`RED' indicating lamp shall be provided for `ON' indication.

7.0 FUSES :

All fuses shall be of HRC cartridge fuse-link type having a certified rupturing capacity of not less than 46 KA at 415 volts AC. The HRC fuses shall conform to IS 9224 1979. All fuses shall have visible indication to indicate `Blown' condition.

8.0 HRC FUSE CARRIERS

The HRC fuse carriers/bases shall be of high grade phenolic moulding. The contacts shall be silver plated and contact blocks shall be suitable to receive the rated conductors of aluminium.

The fuse carriers shall have an aperture to view the conditions of HRC fuse mounted inside.

9.0 CONTACTORS :

The motor starter contactors shall be of the electro magnetic, double-break, non-gravity type rated for uninterrupted duty suitable for operation under AC-3 utilization category as per IS 2959. The contacts shall be silver plated. 2 NO and 2 NC auxiliary contacts shall be included. The operating coils shall have class `E' insulation of wire and shall be suitable for operation of any specified control supply system.

10.0 THERMAL OVERLOAD RELAYS :

The thermal overload relays shall be 3 element, positive action, ambient temperature compensated with a time lag and adjustable settings. The setting range shall be selected in accordance with the ratings of the motor.

The relay shall be self-reset/hand reset as called for. In the case of hand- reset, the reset button shall be fixed on the compartment door.

The relay shall have atleast one `NC' and one `ON' or one change-over contact.

11.0 MOULDED CASE CIRCUIT BREAKERS :

The moulded case circuit breakers, MCCBs shall be provided where specified. The MCCB's shall conform to the latest applicable IS 2516 - 1977.

For AC Circuits the MCCBs shall be triple pole construction and shall have independent manual opening and closing mechanism. The mechanism shall be quick-make and quick-break type and the breakers shall be trip-free in operation. The `ON', `OFF' and `TRIP' mechanism shall be clearly indicated.

Bolted type neutral link to be provided with TP MCCB.

It shall be possible to mount accessories on the MCCBs like shunt-trip and under voltage release, alarm contacts, etc.The MCCB's shall have thermal/static trip devices.

The MCCB's shall have rupturing capacities as specified in BOQ/Single Line Diagram.

12.0 MINIATURE CIRCUIT BREAKERS :

The MCB's shall be of single pole, double pole, triple pole or four pole as required. The MCB's shall be of magnetic type with a minimum rupturing capacity of 3 KA at 415 V.

13.0 CURRENT TRANSFORMERS :

The CT's shall be of dry type and shall have short-time withstand rating equal to the short-time withstand rating of the associated switchgear for 1 second.

The measuring instrument CT's shall be of 15 VA, minimum accuracy class 1.0 and an instrument safety factor of 5.The protection relay CT's shall be of 15 VA, minimum accuracy class 5P and an accuracy limit factor of 10.

14.0 INDICATING INSTRUMENTS AND METERS :

Electrical indicating instruments shall be 72 mm/96 mm/144 mm square size, suitable for flush mounting.The zero adjustment shall be done from outside the cover.

The dials to be parallax free with black numerals on a white dial.

15.0 INDICATING LAMPS :

Indicating lamps shall be of the filament type and of low watt consumption, provided with series resistors and HRC fuse link for protection.The lens shall be easily replaceable from the front.

16.0 CONTROL AND SELECTOR SWITCHES :

The control and selector switches shall be of rotary type, adequately rated for the application but with a minimum rating of 10 Amps at 240 V AC and 1 Amp at 220 V DC. The plates shall have clear position markings.

The control switches shall have pistol grip handles spring return to normal. The selector switches shall have oval knobs and shall be contact stay-put type.

17.0 PUSH BUTTONS :

The push buttons shall be of the momentary contact, push to actuate rated for 10A at 240 V AC and 1 A 220 V DC. The `START` push buttons shall be green and shrouded. The `STOP` push buttons shall be red and enshrouded. All other push buttons shall be black.

The elements shall be enclosed with 1 `NO` and 1 `NC` contacts. It should be possible to add on easily extra elements to increase the number of `NO` and `NC` contacts.

18.0 MAIN & AUXILIARY BUSES :

The busbars shall be of high conductivity copper of current density of 1.6 Amps/sq.mm. The busbar shall be of uniform cross-section throughout the length of the panels.

All main and auxiliary busbars shall be insulated with sleeves. The sleeves shall be of high dielectric strength, non-corrosive and of phase and neutral colours.

The busbars shall be supported on cast epoxy/resin/DMC/Fiberglass insulators and the spacing of the supports shall be such as to withstand the stresses of the short circuit currents. The busbar spacing shall be adequate for 3 phase voltage upto 60V.

The busbar shall be as chosen for specific current ratings with a minimum density of 1 Amp for sq.mm. area.

19.0 L.T. CAPACITORS :

19.1 SCOPE

Scope of these specifications covers the design, manufacture, supply and testing of Mixed Di-Electric L.T. Capacitors.

19.2 STANDARDS :

All relevant Indian Standards will be applicable with latest amendments and in particular IS 2834 of 1986 (Revised).

19.3 MATERIALS AND CONSTRUCTION :

Capacitors shall be provided with metallic containers made up of 16 guage CRCA sheet and shall be heat-proof, dust-proof and rain-proof.

Containers shall be scratch and rust-proof. Containers shall be of metallic construction and the frames shall be earthed.

Each element of the capacitor shall be protected by a fuse mounted inside the container.

Each unit shall be capable of withstanding a continuous over voltage of 10% and designed for low

power loss using tissue paper of polypropylene type.

Each unit shall have fuses rated to isolate itself immediately from the line supply as soon as it has developed any fault. Capacitors shall be of the 3 - phase, delta connected self - cooled weather - proof type with all live parts totally enclosed and suitable for floor mounting.

Capacitor banks shall be erected in cubicle panels and on angle iron frames, with complete treatment done to framework. Framework shall be effectively earthed to the earthing grid.

Capacitor banks shall be provided with suitable cable and box for termination of cables.

Capacitors shall be provided with permanently connected discharge resistors so that residual voltage of the capacitors shall be reduced to 50 Volts or less within one minute after the capacitors are disconnected from the source of supply.

Capacitor banks shall be subject to tests as specified in relevant Indian Standards at the factory and test certificates shall be furnished.

20.0 INTERNAL WIRING :

All internal wiring shall be carried out with 1100 V/650 V grades PVC insulated, stranded conductor copper wires. The minimum size of wires shall be 2.5 sq.mm. and for Cts also 2.5 sq.mm. copper..

All individual control and Cts wiring shall be labeled with engraved identifications ferrules, yellow in colour with black letters.

All wiring shall be terminated on stud type terminal blocks through crimping sockets. No more than 2 connection shall be made on any one terminal block.

All spare auxiliary contacts of contactors and relays shall be wired to control terminal blocks.

21.0 TERMINAL BLOCKS :

Terminal block for power and control shall be of reputed make stud type, with washers, nuts and lock-nuts. All adjacent terminals shall have insulating barriers.

All power terminal blocks shall be appropriately rated for current with a minimum of 30 Amps. The control terminal blocks shall be rated for a minimum of 10A and suitable for atleast 2 conductors each of 2.5 sq.mm.

All sets of power and control power terminal blocks shall be identified with engraved plastic labels, black background and white letters.

22.0 IDENTIFICATION LABELS :

All labels shall be black plastic with white engravings of letters of minimum 6 mm sizes.

23.0 EARTHING :

All switchgears shall have continuous run of earth busbar. The size and materials of the earth busbar shall be specified.

24.0 TARIFF ADVISORY COMMITTEE AND CPRI TESTED :

The switchgear shall be approved by the Tariff Advisory Committee (for Fire Insurance), and CPRI

tested for short circuit test and enclosure test.

25.0 TESTS :

- a. High Voltage test at 2.25 kV.
- b. Power and Control Circuits Continuity Tests.
- c. Insulation resistance test with 1000 V Megar.

26.0 DRAWINGS :

Three sets of general arrangement drawings and wiring diagram of all types of feeders shall be submitted.

27.0 RECOMMENDED MAKES OF SWITCHGEAR AND ACCESSORIES FOR LT PANELS
(Selection by Contractor)

Air Circuit Breaker		: Siemens, L & T, GEC Alstom
Switchfuse Units	:	Siemens, English Electric
MCCBs	:	Siemens, English Electric
ELCBs	:	Siemens, English Electric
HRC Fuses	:	Siemens, English Electric
MCBs & MCCB Isolators	:	Siemens, MG.
MCB & Distribution Board	:	To be fabricated by the Approved manufacture
Changeover Switch	:	HPL S omece, HH, Elecon, Controls & Switchgear Co. Ltd.
Analog	:	Automatic Electric / IMP
Digital Meters	:	Secure
C.T.s	:	Automatic Electric / Indcoil
Indicating Lamps	:	Teknic, Vaishnav
Selector Switches	:	Siemens, Kaycee
KWH Meters	:	GEC / SIMCO
Maximum Demand Meter	:	IMP, EE
Copper Lugs	:	Dowells
Connector Blocks	:	Elmex
Contactors / Starters	:	Siemens, ABB
Auto Changeover Contactor	:	ABB

P.F. Control Relay : Rudrashakti / SIMCO

Capacitors Mixed Dielectric Type: Khatu Junker, Asian, Crompton

Panel Manufacturers :-

Fax No.	Telephone No.
1. M/s Antia Electricals Pvt. Ltd.	285 0384 202 0563, 2021067
2. M/s Star Engg. Industries, Mumbai	830 0310 836 5984 838 8017
3. M/s Elecmech, Mumbai	623 2422 623 2999
4. M/s Manish Engineering Corporation	850 4367 8501653
5. M/s Raj Electricals, Mumbai	670 8395 821 3611

TS 4 : CABLING , TRAYS & TRUNKING

1.0 CABLING :

1.1 GENERAL :

The M.V. cables shall be copper or aluminium conductor, 11000V grade, PVC insulated & sheathed, steel armoured cables conforming to IS : 1554 as per the Bill of Quantities.

The manufacturer's Test Certificate shall be submitted for full drum lengths. All cables shall be inspected receipt at site and checked for any damage during transit.

1.2 CABLE LAYING :

Cable shall be laid by skilled & experienced workmen using adequate rollers to minimise stretching of the cable. Cable drums shall be placed on jacks before unwinding the cable. Great care shall be exercised when laying cables to avoid forming kinks.

Cables shall be fixed on Cable Trays or M.S. supports or on walls/ceiling with M.S. spacers & G.I. saddles at intervals of not more than 500 mm. The M.S. supports & spacers shall be made rustproof and painted with 2 coat of red oxide primer and 2 coats of synthetic enamel paint.

Ladder type Cable Trays shall be fabricated from 50 x 50 x 5 mm M.S. angles on the sides with 25 x 3 mm. M.S. strips welded at intervals of 300 mm. The trays shall be made rustproof & duly painted as above.

The relative positions of cables laid on cable trays or wall/ceiling shall be preserved and the cables shall not cross each other. At all changes in direction in the horizontal or vertical planes, the cable shall be bent smooth with a radius of bend not less than 12 times the diameter of the cable. Cables laid underground shall be so laid that they shall not interfere with other underground services.

All water pipes, sewage lines or other structures which become exposed by excavation shall be properly supported which become exposed by excavation shall be properly supported and protected from injury until the filling has been rammed solidly in place under & around them.

Any telephone or other cables coming existing underground cables or services are damaged by the Contractor the same shall be rectified immediately and made good to the satisfaction of the owner. The cost of the same shall be borne by the Contractor

Excavation shall generally be in ordinary soil and trenches shall be dug to a uniform depth of 650 mm and wide enough for laying the number of cables required. Backfilling shall be done with sifted sand so as to avoid stones & lumps, to a depth of 75 mm before & after laying the cable.

A layer of bricks (full size) shall be laid breadthwise across the cable and the trench shall be filled with excavated earth gradually so as to avoid any damage to the cables or bricks.

Whenever a cable is to laid across a road/drain/culvert, an ACC pipe of suitable diameter shall be embedded under the same and the cable shall be threaded through the pipe. Ends of the pipe shall be plugged to avoid collection of water. Cable indicators shall be fixed at either end indicating the cable position.

1.3 JOINTING OF CABLES :

The Contractor shall take care to see that cables received at site are apportioned to various locations in such a manner as to ensure maximum utilisation and avoidance of cable jointing. Where joints are unavoidable, they shall be made in suitable joint boxes of appropriate size and at convenient locations as approved by the Consultants.

Jointing of cables in joint boxes and the filling-in of compound shall be done in accordance with manufacturer's instructions. All straight & 'T' joints shall be done in epoxy mould boxes with epoxy resin.

The conductors shall be firmly butted into the lugs and soldered with proper solder & flux.

The cables shall be joined colour to colour and each conductor shall be wrapped just below the lug with PVC tape of red, yellow & blue colours to indicate the respective phases and black colour to indicate the neutral.

The seals of cables must not be removed until preparations for jointing are completed. Joint shall be finished on the same day as commenced and sufficient protection from the weather shall be arranged.

1.4 BONDING OF CABLES :

Where a cable enters any piece of apparatus, it shall be connected to the casing by means of an approved type of armoured clamp & gland. The clamps must grip the armouring firmly to the gland. The clamps must grip the armouring firmly to the gland or casing so that no undue stress is passed on to the cable conductors due to vibration. The glands must be fixed to the lead sheath by means of either a plumbing joint or a cone of approved material capable of effecting a good electrical bond between the armouring of the cable and the casing.

1.5 CABLE TERMINATIONS :

Cable terminations shall be carried out with 'Siemens' type single compression brass glands and crimping type copper lugs. Anti-corrosive inhibiting flux shall be used.

1.6 CABLE IDENTIFICATION :

For each cable, PVC ferrule type indicators or tags shall be provided at both ends for identification. For phase identification of the cores, PVC tapes shall be used at both ends.

All exposed cables shall be provided with aluminium tags of approved design spaced not less than 8 Mtrs apart containing the following information : (a) Feeder Number (b) Size & number of cores.

1.7 TESTING :

Tests shall be conducted for each length of cable for insulation between phases and between phase & earth before & after lay in or jointing.

2.0 CABLE TRAYS :

Cable trays shall be ladder type and fabricated out of Aluminium sheet or GI sheet as specified in the bill of quantities. Cable tray shall be fabricated in standard lengths of 2440 mm using semi hard Aluminium sheets or GI sheet.

The dimension of side rail shall be 100 mm depth & 2.5 mm thick. The rung shall be 2.5mm thick with a section of 40 x 20 x (w +50) where W = width of tray. There will be 10 nos. of rungs per standard length. The sections of tray shall be joined together with coupler plates of size 82 x 50. If the span of support is greater than 1.5 Mtrs. then folded coupler shall be used. Fasteners used shall be stainless steel SS304 with 8 nos. for tray assembly and 8 nos. for coupler. Tray shall be supported with painted MS angle supports with minimum spacing of 750 mm between supports.

Ladder type cable trays shall be fabricated from 50 x 50 x 5 mm M.S. angles on the sides with 25 x 3 mm M.S. strips welded at intervals of 300 mm. The trays shall be painted with 2 coats of red oxide & 2 coats of synthetic enamel paint of approved colour.

3.0 TRUNKING :

M.S (Surface / Conceded / Underfloor) :

The under floor trunking shall be fabricated from 14 guage CRCA sheets duly painted with two coats of Red Oxide Primer and 2 coats of Synthetic Enamel Paint of approved colour.

Cover for the trunking shall also be fabricated as above and shall be fixed with rust proof screws.

Junction boxes shall also be fabricated as above and shall be provided at suitable locations so that the cables may be pulled or replaced or additional cables may be pulled whenever required in future.

TS 5 : LIGHTING FIXTURES :

Fluorescent lighting fixtures shall be provided with heavy duty, polyster, filled, copper wound chokes, HPF condensers & good quality starters. 20A 3 way terminal connectors shall be provided for termination & looping of wires inside the fixtures.

Recessed type fluorescent fixtures shall be fixed firmly to the false ceiling by provided rigid timber or M.S. fixing clamps. Cost of timber frame or M. S. Clamps shall be included in the rate for installation of fixtures. Surface type fixtures shall be mounted on walls / ceiling with rawal plugs & brass screws. Spotlight and Recessed PL lamp / fixtures shall be of brass either gold plated or powder coated as approved by consultants.

Transformers for Halogen Lamps shall be 230 / 12 Volts, suitable for 50 watts or 75 watts lamps as required. The transformer core shall be manufactured with good quality CRGO stampings. The

transformer shall be with copper winding and shall be vacuum impregnated.

Recessed PL lamp fixtures square or rectangular type shall be fabricated with CRCA sheet and Power coated white.

TS 6 : EARTHING :

1.0 EARTHING :

1.1 GENERAL :

All the non-current carrying metal parts of electrical installation shall be earthed properly. All metal conduits, trunking, cable sheaths, switchgear, distribution fuse boards, lighting /fans / 5 Amps plug points and fixtures /fittings and all other parts made of metal shall be bonded together and connected by means of specified earthing system. All earthing conductors to an efficient earthing system. All earthing will be in conformity with the relevant provision of Rules 33 and 61 of the Electricity Rules 1956 and Indian standard specification IS : 3043 - 1956.

1.2 EARTHING CONDUCTORS :

All earthing conductor shall be of high conductivity copper or G.I. and shall be protected against mechanical injury or corrosion.

1.3 SIZING OF EARTHING CONDUCTORS :

The cross sectional area of copper earthing conductor shall not be smaller than half that of the largest current carrying conductor subject to an upper limit of 80/125 sq.mm. If the area of the largest current carrying conductor or bus bar exceeds 160 sq.mm. then two or more earthing conductors shall be used in parallel, to provide at least half then cross sectional area of the current carrying conductor or bus bars. All fixtures, fans, outlet boxes and junction boxes shall be earthed with G.I./Copper wire. All single phase metal clad switches and distribution boards shall be earthed with 4 mm. dia bare copper/G.I. wire.

All 3 phase switches and distribution boards upto 60 amps rating shall be earthed with 2 nos. distinct and independent 4 mm dia bare copper/G.I. wires. All 3 phases switches and distribution boards upto 100 amps rating shall be earthed with 2 nos. distinct and independent 6 mm. dia bare copper/G.I. wire.

All switches, bus bar ducts and distribution boards of rating 200 amps and above shall be earthed with a minimum of 2 nos. separate and independent 23 mm x 3 mm copper / G.I. tape. Transformer neutral shall be earthed with two separate electrodes. The minimum size of copper strip for Transformer neutral earthing shall be 50 mm x 3 mm.

Main earthing conductors shall be taken from the earth connections at the main switch boards to on earth electrode with which the connection is to be made. Sub-main earthing conductors shall run from the main switchboard to the sub - distribution boards. Final distribution boards earthing conductors shall run from sub distribution boards.

Circuit earthing conductor shall run from the exposed metal of equipment and shall be connected to any point on the main earthing conductor, or its distribution boards or to an earth leakage circuit breaker.

Metal conduits, cable sheathing and armouring shall be earthed at the ends adjacent to switchboards at which they originate, or otherwise at the commencement of the run by an earthing conductor in

effective electrical contact with cable sheathing. where equipment is connected by flexible cord, all exposed metal parts of the equipment shall be earthed by means of an earthing conductor enclosed with the current carrying conductors within the flexible cord.

Switches, accessories, lighting fitting, etc. which are rigidly secured in effective electrical contact with a run a metallic conduit shall not be considered as a part of the earthing conductor for earthing purposes, even though the run of metallic conduit is earthed.

1.4 PROHIBITED CONNECTIONS :

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

The electrical resistance of metallic enclosures for cables and conductors no assured 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 fuse or circuit breakers and shall not exceed 1 ohms.

1.5 PROTECTION FROM CORROSION :

Connections between copper and galvanised equipment shall be made on vertical face and protected with paint and grease. Galvanised fixing clamps shall not be used for fixing earth conductors. Only copper fixing clamps shall not be used for fixing earth conductors. When there is evidence that the soil is aggressive to copper, butted earthed conductors shall be protected by suitable serving and sheathing.

1.6 EARTHING STATION :

Plate Electrode Earthing : Earthing electrode shall consist of a tinned copper plate not less than 600 mm x 600 mm x 3 mm. thick or 600 mm x 600 mm x 6 mm G.I. as called for in the drawing or as specified in Bill of Quantities. The plate electrode shall be burries as far as practicable below permanent moisture level but in any case not less than 3 meters below ground level.

Wherever possible earth electrodes shall be located as near the water tap, water drain or a down take pipe as possible. Earth electrodes shall not be installed in proximity to a metal fence. It shall be kept clear of the building foundation and in no case shall it be nearer than 2 meters from the outer face of the wall. The earth plate shall be set vertically and surrounded with 150 mm. thick layer of charcoal dust and salt mixture. 20 mm G.I. pipe shall run from the top of the pipe shall be provided with funnel and an mesh for watering the earth through the pipe. The funnel over the G.I. pipe shall be housed in masonry chambers approximately 300 mm x 300 mm x 300 mm deep. The masonry chamber shall be provided with a cast iron cover resting over a D.I. frame embedded in masonry.

1.7 PIPE ELECTRODE EARTHING :

Earthing electrode shall consist of a G.I. pipe (class `B') Indian Tube Company make or approved equal, not less than 40 mm dia and 5 meters long. C.I. pipe electrode shall be cut tappered at the bottom and provided with holes of 12 mm. dia drilled at 75 mm interval upto 2.5 meters length from bottom. The electrodes shall burried vertically in the ground as far as practicable below permanent moisture level with its top not less than 200 mm below ground level. The electrode shall be in one piece and no joints shall be allowed in the electrode. Wherever possible earth electrodes shall be located as near water top, water drain or a down

take pipe. Earth electrode shall not be located in proximity to metal fence. It shall be kept clear of the building foundations and in no case shall be nearer than 2 meters from the outer face of the wall.

The pipe earth electrode shall be kept vertically and surrounded with 150 mm thick layer of charcoal dust and salt mixture upto a height of 2.5 meters from the bottom. At the top of the electrode a funnel with a mesh shall be provided for watering the earth. The main earth conductors shall be connected to the electrode just below the funnel with proper terminal lugs and checks nuts. The funnel over the GI pipe and earth connection housed in a masonry chamber, approximately 350 mm length x 300 mm wide and 300 mm deep. The masonry chamber shall be provided with a cast iron cover resting over a C.I. frame added in masonry.

1.8 EARTH CONNECTION :

All metal clad switches and other equipment carrying single phase current, shall be connected to earth by a single connection. All metal clad switches carrying medium voltage and high voltage shall be connected with earth by town separate and distinct connections. The earthing conductors inside the building wherever exposed shall be properly protected from mechanical injury by running the same in G.I. pipe of adequate size.

Earthing conductors outside the building shall be laid 600 mm below the finished ground level.

The over lapping in copper strips at joints where required shall be minimum 75 mm. The joints shall be rivetted with copper rivets and brazed in approved manner. Sweated lugs of adequate capacity and size shall be used for all termination of wires above 6 sq.mm. size and bare copper wire above 2.5 mm dia. Lugs shall be bolted to equipment body to be earthed after the metal body is cleaned of paint and other oily substance and properly tinned.

1.9 EARTH RESISTANCE :

The earth resistivity of the soil where the earthing stations are located shall be submitted to the Architect before the earthing work started and get the approval of the Architect. If the earth resistance is too high and multiple electrode earthing does not give adequate low resistance to earth, then the soil resistivity immediately surrounding the earth electrodes shall be reduced by adding sodium chloride, calcium chloride, sodium carbonate, copper sulphate, salt and soft coke or charcoal in suitable proportions as directed by the Architect.

1.10 RESISTANCE TO EARTH :

The resistance of each system shall not exceed 1.0 ohm in the case of M.V. system and 0.5 ohm in the case of H.V. System.

TS 7 : TELEPHONE SYSTEM CABLING :

SCOPE :

Scope of this section covers the supply, laying and testing of telephone conduits and cables. Telephone cables shall be supplied and laid for both external telephone connections and for inter communication system as required. The supply of EPABX and associated equipments are not included in the scope of this tender.

DEFINITIONS

ADAPTER : It will be a device that will enable different sizes or shape of plugs to mate with one another or to fit into a telecommunications outlet or provide for the rearrangement of leads that allow large cables with numerous wires to fan out smaller groups of wires, or make interconnections between cables.

CROSS CONNECT : A group of connection points, wall or rack mounted, tied to mechanically terminate and administer building wiring.

PATCH CORD : A length of wire or optical fiber cable with connectors on each and used to join communications circuits at a cross connect.

PATCH PANEL : A system of terminal blocks, patch cords, backboards that facilitate administration of cross – connected fields for moves and rearrangements.

TELECOMMUNICATIONS OUTLET : A connecting device located in a work area on which horizontal wiring system cable terminates and which will receive a mating connector.

BASIS OF DESIGN :

Depending upon the characteristics of the individual application, choice with respect to transmission media have been made.

In making this choice factors which have been considered include.

- a. Flexibility with respect to supported services.
- b. Required useful life of backbone wiring.
- c. Site size and user populations.
- d. Since building occupants need for telecommunications services vary over time and from occupant to occupant hence plans for the future use of the backbone wiring may range from highly predictable to very uncertain. Wherever possible, different service requirements have been determined.

1.1 BACKBONE WIRING :

General

The function of the backbone wiring shall be provide interconnections between telecommunications wiring system. The backbone wiring shall consist of the transmission media, intermediate and main cross connects, and mechanical terminations for interconnection of telecommunications closets, equipment rooms and entrance facilities. The backbone wiring shall include transmission media in the building.

The backbone wiring shall use the star topology wherein each telecommunications closet shall be wired to a main cross connect / patch panel or an intermediate cross connect then to a main cross-connects / patch panel. There shall be no more than two hierarchical levels of cross connects / patch panel in the backbone wiring. Interconnections between any two telecommunications closet shall pass through three of four cross – connects / patch panel.

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

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

100 –ohm UTP multiplier backbone cable.
150 –ohm STP cable.
50 –ohm coaxial cable.
62.5 / 12.5 cum optical fiber cable.

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

1.2 HORIZONTAL WIRING :

General

The horizontal wiring shall be the portion of the telecommunications wiring system that will extend from the work area telecommunications outlet to the telecommunications closet. The horizontal wiring shall include the telecommunications outlet in the work area, mechanical termination for the horizontal cables and cross-connections located in the telecommunications closet.

The horizontal wiring shall be capable of handling the following minimum services.

Voice Telecommunications.

Premises switching equipment.

Local area network (LAN)

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

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

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

Four-pair 100 ohm unshielded twisted pair (UTP) cables.

Two-pair 150 ohm shielded twisted pair (STP) cable.

50 ohm coaxial cables.

62.5/125 cum optical fiber cable.

1.3 GROUNDING CONSIDERATIONS :

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

Grounding shall meet the NEC requirements and practices or local authorities or codes whichever impose a more stringent requirement.

The following shall be considered for the grounding system.

Installation conforms with proper practices and requirements.

Each telecommunications closet shall have an appropriate grounding access.

Grounding shall be available for cross-connect frames, patch panel racks, telephone and data equipment and equipment required for maintenance and testing.

1.5 BACKBONE WIRING DISTANCES :

1.1.1 **Telecommunications Closet to Main Cross-Connect**

The maximum backbone distance between the main cross-connect patch panel and the mechanical termination in the telecommunications closet shall be as follows :

For 62.5/125 ohms optical Fiber cable the distance between Telecommunication closet and main cross connect patch panel shall not exceed 2000 mts.

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

For 150 ohm STP cable, maximum distance between telecommunication closet and main cross connect panel shall be 700 mts.

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

1.6 WORK AREA

The work area shall be defined as those components which extend from the telecommunications outlet end of the horizontal wiring to the station equipment. The station equipment shall be any of the number of devices including but not limited to telephones, data terminals and computers.

When adapters are needed at the work area, they shall be external to the telecommunications outlet. Following adaptations at the work shall be followed.

A special cable or adapter when the equipment connector is different from the telecommunication outlet connector.

A "Y" adapter when two services run on a single multiplier cable.

Passive adapters when the cable type in the horizontal wiring is different from the cable type required by the equipment. Active adapters when connecting devices use different signaling schemes.

Pair transposition wherever necessary for compatibility.

Termination resistors wherever required in the work area. These shall be external to the telecommunications outlet.

1.7 TELECOMMUNICATIONS CLOSET

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

1.7.1 Horizontal Backbone Connection

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

1.7.2 Backbone Wiring System Interconnection

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

1.7.3 Entrance Facilities :

A telecommunications closet may be used to contain the demarcation point or an interbuilding entrance facility. In this usage, the telecommunications closet shall provide facilities for the active and / or passive devices required to interconnect the demarcation point or interbuilding entrance facility or both to the telecommunication wiring system.

The design of the telecommunications closet shall be as per the requirements of EIA/TIA –569.

1.8 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.

1.9 CABLE SPECIFICATIONS

1.1.1.1.1 General

This section covers the detailed specifications of the cable for the horizontal and backbone wiring sections. All cables shall meet the requirement of the ETA 568 category 5 for voice whichever impose a more stringent requirement.

1.9.1 100 ohm Category 5 UTP Cable

The cable shall be restricted to four pair size to support a broad range of applications. The pair twists of any pair shall not be exactly the same as any other pair. The pair twist lengths shall be selected by the manufacturer to ensure compliance with the crosstalk requirements of this standard

Color Codes

The color codes shall be as shown below :

TS 7/7

Conductor

Color Code

Abbreviation

Identifications

Pair 1	White – Blue	(W-BL)
	Blue	(BL)
Pair 2	White – Orange	(W-O)
	Orange	(O)
Pair 3	White – Green	(W-G)
	Green	(G)
Pair 4	White – Brown	(W-BR)
	Brown	(BR)

1.9.2 Cable Diameter

The diameter of the jacketed cable shall be less than 6.35 mm.

DC Resistance

The resistance of any conductor, measured in accordance with ASTM D 4566 shall not exceed 28.6 ohms per 1000 ft.

DC Resistance Unbalance

The resistance unbalance between the two conductors of any pair shall not exceed 5% in accordance with ASTM D 4566

1.9.3 Mutual Capacitance

The mutual capacitance of any pair at 1 Khz, measured in accordance with ASTM D 4566 shall not exceed 20 nF per 1000.

Capacitance Unbalance Pair to Ground

The capacitance unbalance to ground at 1 Khz of any pair, measured with ASTM D 4566 shall not exceed 1000 pF per 1000 ft.

1.1.2 1.9.4 **Attenuation**

The attenuation of any pair, measured in accordance with ASTM 4566 shall not exceed the following values.

Frequency (MHz)	Maximum Attenuation (dB per 1000 ft)
0.772	5.5
1.0	6.3
4.0	13
8.0	18
9.0	20
16.0	25
20.0	28
25.0	32

31.25	36
62.5	52
100	67

1.9.5 Characteristic Impedance

The characteristic impedance shall meet the following requirements when measured using the equipment test procedure given in the ASTM D 4566

1.1.2.1.1	Frequency (Mhz)	Characteristic Impedance (Ohms)
	0.064	125 +/- 15%
	0.128	115 +/- 15%
	0.256	110 +/- 15%
	0.772	102 +/- 15%
	1.0 – 16.0	100 +/- 15%

1.9.6 Near and Crosstalk

The near end cross talk coupling loss between any two pairs within a cable shall be in accordance with ASTM D 4566.

1.1.3 1.9.7 **Hook – Up wire**

The hookup wire shall be solid annealed copper conductors individually insulated with PVC with insulation marked at regular intervals with an additional code for colors. The pair sizes shall be 1.2.3 or 4 as specified in schedule of quantities.

The electrical specifications shall be as follows :

DC Resistance	52 ohm per 1000 ft.
Mutual capacitance	4.9 nF per 100 mt.

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 & 10 B A S E – T. the pair sizes shall be as per the schedule of quantities. The cable shall meet the following specifications.

Maximum DC Resistance	26.5 ohm per 100 ft.
Maximum DC Unbalanced Resistance	17%
Mutual Capacitance at 1 Khz	16 nF per 1000 ft.

1.10 SYSTEM OF CABLING :

1.10.1 All cabling, wiring and junction boxes for the telephone system shall be provided on tray and in conduits.

1.11 TELEPHONE CABLES :

1.11.1 Telephone cables shall be of copper conductors, PVC insulated and PVC sheathed armoured or unarmoured as specified. Telephone cables shall comply with I.T.I. or I.T.L. specifications

and in case of armouring to IS - 1554 Part - I 1964. Copper conductors shall be of 0.5 mm, 0.6 mm & 0.71 mm diameters, depending on the sizes specified.

- 1.11.2 Each conductor shall be PVC insulated with a different colour as per the colour codes and shall be twisted together with its mate conductor to form a pair. All pairs shall be PVC insulated and supplied with Nylon Rip Cord to facilitate easy unsheathing without damaging the PVC insulation.
- 1.11.3 Raw materials used in the manufacture of telephone cables shall be of high grade and quality. The conductors shall be drawn from high purity electrolytic copper and shall be annealed & tinned. The PVC insulation shall be of high grade and shall be resistant to ageing and fading, to ensure identification of colour etc., after prolonged use.
- 1.11.4 The type, size and pairs shall be as given in the Bill of Quantities.
- 1.11.5 All multi-pair cables and 2 core telephone distribution cables shall be laid in G.I. / M.S. Conduits. Wherever multi-pair cables are to be laid in the open on walls and ceilings, these cables shall be of the armoured type. Separate conduits shall be used for external and intercommunication systems. Conduits shall be coloured as per the ITD colour code. The extended runs of conduits shall be fitted with 150 mm x 75 mm MS pull boxes. Pull boxes shall be suitably painted for easy identification and shall be provided at intervals of 5 Meters. Pull boxes shall be of the surface mounting type or flush - mounting type as specified.

1.12 TAGBLOCKS :

Telephone tag blocks shall be compact design (krone type) suitable for multipair telephone cables and shall have two terminal blocks, cross connected type.

All incomings and outgoing cables shall be terminated on separate terminal blocks and the terminations shall be done with the special tool recommended by the manufacturers/suppliers of the tag blocks.

The tag blocks shall be mounted inside fabricated sheet steel boxes with removable hinged covers and shall be fully accessible. The enclosures shall be duly painted with 2 coats of red oxide and 2 coats of synthetic enamel paint.

Numbering ferrules shall be provided for each telephone cable.

1.1.4 TS 8 : ANALOGUE ADDRESSABLE FIRE ALARM SYSTEM

1.0 SCOPE OF WORK

The scope of work under this head shall include designing supplying and installing of Analogue Addressable Fire Detection cum Alarm System and shall cover areas marked by the layout diagram plus any other area which may be decided subsequently to be protected by Analogue Addressable Fire Alarm System.

- 1.1 The work under this system shall consist of furnishing all materials, equipment's and appliances and labour necessary to install the said system, complete with Detectors, Main Control Panel, Sounders, Strobes, Manual Call Stations, relays etc. for disconnecting other systems such AHUs and electric supply etc.
- 1.2 It shall include laying of cabling duct, conduits and power supply etc., necessary for installation

of the system with supply of detectors and appropriate type as indicated in the specification and Bill of Quantities. Any openings/chasing in the wall/ceiling required to be made for the installation shall be made good in appropriate manner.

- 1.3 The Bidder shall also undertake to trip from the Fire Alarm Panel through the use of Addressable Output Modules, individual AHU activated by the fire signal of specified detectors and Input Modules for monitoring water flow switches and other contacts like magnetic door contacts.
- 1.4 The Building shall have a multi zone panel with each area forming of one or more software programmed zones. All wiring shall be done using 2 x 1.5 mm² twisted pair shielded PVC insulated armoured copper cable

2.0 PREAMBLE :

- 2.1 Since each Bidder will have his own technical terms for the equipment's offered, in order to bring commonality the Bidder will be required to give his equivalent name for the terms indicated here under. The Bidder shall in all his communications state the equipment/product by the next to the term. In case his equipment does not match the general terms of this specification. The Bidder shall be required to state specifically how his equipment is different but that it meets the requirements of the specifications.

2.1.1 FIRE ALARM PANEL (FACP) :

This refers to the microprocessor based panel that shall be connected to the various detector/devices by means of 2 wire loops.

The FACP shall be able to identify individual detectors for performance as well as to give pinpoint location of fire alarm. Hooter Alarm as well as facility for cutting off of AHUs and electrical power is also be included.

2.1.2 LOOP :

A loop shall mean a 2-wire circuit connecting 176 Addressable devices which shall include 126 Analogue services and 50 Addressable Loop Sounders. The loop card shall have built-in short circuit isolators to accommodate Class A wiring.

2.1.3 ADDRESSABLE DEVICES :

This term indicates the complete group of addressable detectors, Manual call Stations, addressable output /input modules etc.

2.1.4 DETECTORS :

The Detector shall be analogue addressable type. The chamber should be easily removable for the purpose of easy maintenance. The address programming shall be done by a handheld programmer or from the FACP. The detectors shall have a common base to allow easy interchange of various types of detectors. Address setting by DIL Switch or Decade Switch shall not be acceptable.

2.1.5 MANUAL CALL STATION :

The Manual Call Station shall be addressable type with input modules to define the Station. The function shall be similar to that of conventional Manual Call Box and should be resettable without

replacing the glass.

2.1.6 INPUT / OUTPUT MODULE :

Output module shall mean addressable points from the FACP with potential free contacts for tripping of AHUs, power supply etc. as required. Any module shall be able to handle one input and operate two relay outputs powered from the loop and preferably consuming single address on the loop. The system shall also be able to handle separate modules to interface the speakers of the Public Address System.

2.1.7 INPUT MODULE :

The input modules shall be of dual/single channel type. The dual channel module shall be selectable for Normally Open or Closed by a 2 bit DIL switch. Optionally the input module shall be of monitored type.

2.1.8 FAULT ISOLATOR :

This equipment shall be placed in the electrical wiring preferably after every 20 devices and shall be able to isolate electrical short and open circuit wiring. All the other detectors shall remain functional because of the Class A wiring of the loop.

2.1.9 HOOTER / SOUNDERS :

The Hooter shall be made addressable by means of bell control modules with supervised outputs (preferably two channel occupying a single address in the loop but individually programmable). In case the bell control modules requires an auxiliary power the same shall be monitored. Interface to loop powered sounders should also be possible if required.

3.0 SPECIFICATION :

- 3.1 The design, supply and installation and testing of the entire fire alarm system shall conform to BS : 5839 or NFPA 71 and 72 and spacing of detectors shall conform to IS2189 standards. The detectors shall conform to relevant codes for Fire Alarm Systems
- 8.3.2 A general line diagram showing the circuit and spacing of detectors is to be enclosed. The quantities mentioned in the Price Schedule is mainly for the guidance of bidders. The drawings have to be collected and verified and if any variance with IS 2189 standards the same has to be followed.

4.0 FIRE ALARM SYSTEM :

- 4.1 The Fire Alarm System shall conform to BS: 5839 or NFPA 71/72 in respect of design and installation, and it shall give Audio/Visual Alarm Signals when the temperature in case of Heat Detector or smoke density in case of Photo Detector exceeds the pre-set limit. The system shall give pin point location of fire with warning system and voice communication for commands and instruction if required.
- 4.2 The system shall be a microprocessor based control with monitoring facility. The basic function of the system shall be able to achieve pin point location of alarm indication. Secondary functions such as pre warning of possible alarm situation, self diagnosis, checking upon faulty detectors and switching on/off of unrelated activities such as AHUs and Power Supply, shall also be possible in this system.

- 4.3 It shall be possible to program each loop with up to 176 detectors/devices/loop sounders in a circuit. The FACP itself shall have the mother boards/interface of each loop built-in.
- 4.4 Annunciation (Hooter Alarm) facility shall also be inbuilt into the FACP, the panel being able to initiate alarm signal for any particular zone.
- 4.5 The system shall be fully supervised for all fault conditions with distinctive alarm operated for fault and fire conditions. Test push buttons software features shall be provided to test the electronic circuits and detectors conditions.
- 4.6 The FACP shall be so programmed that when a particular detector or group of detectors give a fire signal the FACP should be able to trip an individual AHU automatically. In case of Fire in a area conditioned by an AHU the FACP shall be able to trigger a Relay that shall shut off the AHU through an additional contact provided in the AHU panel by the AC contractor.
- 4.7 The FACP shall have the provision for adding an extra loop card to cater for a possible Card Burn out/ malfunctioning. The loop card shall be incorporated in the FACP itself. The bidder shall have the FACP software as to be able to change the terminals of any of the loops from any operating card to the extra card. Additional Software changes that may be required to fit the extra card into a particular loop shall be carried out at site as and when required at extra cost, except during the period of guarantee.
- 4.8 The FACP shall have facility to connect 126 addressable input/output devices in the peripheral RS 485 bus. These may be 8 way input card, 4 way relay card, 4 way sounder card, passive/active repeater panels and mimic driver cards.
- 5.0 FIRE ALARM CONTROL PANEL (FACP) :
- 5.1 The Fire Alarm Control Panel shall be micro processor based fully Analogue Addressable, Analogue Control Unit which shall control all Analogue Addressable Detectors, Manual Call Stations and Switching Systems (for disconnecting AHU and power supply) connected to it.
- 5.2 All addressable units shall be connected to the FACP through the Loop Cards and shall be addressed through individualised numbers. The FACP shall be able to obtain analogue value for all detectors in the circuit through a pulsed digitalised current data. The FACP shall be able to analyse all analogue inputs from all addressable units, and through its own software and ambient level screening the FACP shall be able to identify fire, possible fire or fault conditions. The unit supervision shall be dynamic and continuous.
- 5.3 The FACP shall itself have all loop cards in it. No isolated mother board or transponder shall be considered. Each loop shall be able to address a 126 addressable detectors and 50 loop sounders with a total of 176 addressable devices per loop.
- 5.4 The FACP shall also give adequate warning signal whenever there is dust accumulation in detectors, and up to the point of its replacement it should be possible to change the level of ambient alarm calibration condition either by the use of software program operable by the owner or by resetting the detector.
- 5.5 Short / Open circuit units shall also be reported at the FACP In such cases, the system through the use of fault isolators shall be able to isolate that segment between the two fault isolators. The missing Detectors/Devices shall also be reported at the FACP with identification of the

location.

- 5.6 The FACP shall have the facility to set smoke sensor sensitivity remotely to either high sensitivity manually or on a pre-programmed sequence (i.e Day/Night) period.

TS 8/6

- 5.7 When an alarm condition is sensed at the FACP from a smoke or heat detector, a delay time/alarm verification period shall be started. If the sensor is still in alarm after the delay time expires, an alarm condition is reported. The delay time shall be adjustable from 0 to 990 secs.
- 5.8 The FACP shall have facility to perform walktest such that an operation can be periodically checked out for all initiating devices. As each device is placed into alarm the FACP shall print the condition and automatically reset the device. Audible devices shall be initiated, if required at a preprogrammed time. If a zone is inadvertently left in walktest mode, it shall automatically reset to normal after the idle time is exceeded. During the walktest the zones other than the programmed zones shall be under continuous supervision (normal mode). In case of any alarm initiated by detector/devices the walk test shall get terminated automatically.
- 5.9 Programming functions shall include alarm/trouble type assignment, point descriptor assignment, alarm message assignment, etc.
- 5.10 Programming may be carried out from the FACP key board or utilising the approval PC setup software via laptop/desktop computer.
- 5.11 The FACP shall have a Liquid Crystal Display of Alphanumeric type to indicate immediately all conditions. The display should be high resolution, backlit 2 (lines) x 40 character. In case of testing of the system from the FACP the Display shall be able to give readouts of analogue value of all detectors being tested. The FACP shall also be able to carry out continuous self monitoring when in normal condition.
- 5.12 The FACP shall have either an in-built or external printer coupled to the FACP which shall log all events with time. The printout shall clearly indicate the event - Fire/Pre Alarm/Fault etc. with the unit address and time.

TS 8/7

- 5.13 The FACP shall also be able to discriminate between false alarms and fire conditions, as well as priority selection of alarm in case alarm activates in two or more remotely located units simultaneously. In such cases, the Manual Call stations shall have the highest priority.
- 5.14 The FACP also be able to actuate switches automatically in case of Fire condition that of AHU's and power supply or other systems such as piped pressurised gas supply.
- 5.15 In this respect the bidder is required to take note of clause relating to cutting off of AHUs given above. The bidder shall indicate in his bid what facilities shall need to be provided by the Client for completion of this mechanism.
- 5.16 The System shall be fail safe and adequate safe guards should be under taken that in the event of a failure of a part of the System it shall not handicap the complete System. The Loop Cards shall be of Modular Construction.
- 5.17 The Bidder shall undertake the responsibility of the complete installation, commissioning, user

trials, training and maintenance of the System as required. The Bidder shall take all responsibility for preparation and installation of System Software into the FACP. The Software shall be such so as to be easily operated by the Client's Personnel and secured against Software errors, ability to be upgraded so as to incorporate more features at a later date.

- 5.18 The FACP shall have its own Battery Backup of a minimum of 48 hours in normal run and then half an hour in alarm condition. The back up time calculation shall be done as per IS 2189 standards. The Battery shall be 2*12V (24V) DC and of sealed maintenance free type, housed inside the FACP.
- 5.19 It shall be able to withstand temperature variations from 00 centigrade to 550 centigrade. Further, Relative Humidity (non condensing type) up to 95% shall not hamper its performance. The voltage rating shall be from 17V DC to 31V DC, though the voltage may be change depending upon the working voltages of a proprietary FACP.

TS 8/8

- 5.20 The FACP shall be totally enclosed dust and vermin proof type made of minimum 16 gauge dust inhibited sheet with even baked finish. The FACP shall be of completely solid stage design.
- 5.21 The logic circuitry shall be based on high noise immunity solid state hardware employing modular construction. Logic cards shall be of epoxy fiber glass construction.
- 5.22 The FACP shall have EN 54/UL/FM approval.
- 5.23 Further, the system shall be able to add atleast 10% of the Detectors/Devices for future expansion.
- 5.24 8.5.24 The panel shall have an extra loop card to serve as standby in case of burn-out or malfunctioning of any operating loop cards.
- 5.25 The panel shall have software to cater to the change over of any of the operating loop cards to the extra loop card. Other software necessary to actually change the terminals of a loop from and existing loop card to the extra loop card shall be carried out at site as and when required. Charges for such software, loading test run etc. shall be indicated when required.
- 5.26 The FACP shall be capable of being networked (future expansion) with other similar FACPs located at different part of the premises through a single RS485 bus.
- 5.27 The FACP shall have provision for interfacing with the Public Address System

6.0 ADDRESSABLE TYPE SMOKE DETECTOR :

A. PHOTO ELECTRIC TYPE :

6.1

- a. All detectors are fitted with plug-in system type connections, from the maintenance and compatibility point of views. An alarm release will not effect a detector's good functioning. After resetting the alarm, the detector will resume operations without readjustment of any kind.

- b. The detector shall have a linear response over all types of fire. It shall be possible to use only a single detector type/model for both above and below false ceiling applications. The detector shall be capable of detecting fast flaming fires and slow smouldering fires equally well. The detector shall therefore be a multi technology detector or shall be of unique design whereby a single type/model can be used in applications where either ISD/OSD would be normally used. Detectors using radioactive elements shall have BARC approval.
- 6.2 The detector shall be able to sense incipient fire by detecting the presence of visible and invisible products of combustion. The detector shall be suitable for low voltage (17 to 31V DC) two wire supply. The detector shall be provided with Twin LED indication and the sensitivity of the detector shall not vary with change in ambient temperature, humidity, pressure or voltage variation.
- 6.3 Neither its performance shall be affected by air current up to 1.52 mtr per second. The detector shall be suitably protected against dust accumulation/ ingress and it shall be free from maintenance and functionally tested at intervals. All detectors shall be identical in construction design and characteristic to facilitate easy replacement.
- 6.4 The coverage per smoke detector shall strictly follow IS 2189 standards. It shall be possible to connect Smoke Detector with Heat Detector or Manual Push Button in the same circuit. The sensitivity of detector shall be set from the FACP to suit the site requirement.
- 6.5 It shall have in-built locking mechanism to check the removal and pilferage of the detector. The quiescent current flow must not exceed 400 microamps and alarm condition current shall be maximum 40 milli amps.
- 6.6 The Photo Electric type Smoke Detector shall be Analogue Addressable type and be able to send analogue output to the FACP regarding its condition. It shall be able to communicate with the FACP by the pulses emitted from the FACP. The detector should be programmed using a hand-held programmer and address stored in a non-volatile memory within the sensor or by a decade switch.
- 6.7 The base of the Detector shall be electronics free and interchangeable with other smoke or heat detectors. The enclosure shall meet IP 42 protection grade.
- 6.8 It shall be able to withstand temperature variations from - 10 degree centigrade to 50 degree centigrade. Further, Relative Humidity (non condensing type) up to 80% shall not hamper its performance. The voltage rating shall be from 17V -31V DC though the voltage may be changed depending upon the working voltages of a proprietary FACP.
- 6.9 The Detector shall meet the requirements of either EN 54/ FM/UL or LPCB. It shall be possible to test the Detectors working both from the FACP as well as locally by means of a handheld programmer tester.
- 6.10 It shall be possible to mount the detectors in Duct Casting Unit for amplifying of Supplying Air from the AHUs. Secondary response indicators shall be provided for all the Above False Ceiling Detectors.
- 6.11 The detector shall have twin LED's for 360 degree viewing angle. LED on the detector shall blink each time the sensor is scanned by the IFAS. If the FACP determines that the sensor is in alarm, the FACP will command the sensor LED to remain on to indicate the same. Each sensor will be capable of being tested for alarm via command from the FACP. Each sensor shall respond to FACP scan with the information about its type for identification.

- 6.12 It shall be possible to connect loop powered base sounders on the detector loop. The sounder shall have a sound output of atleast 85db and will not require a separate cable for power supply.

B. HEAT DETECTOR :

Heat detector shall be similar to photoelectric type smoke detector but provide temperature measurement when it reaches pre-alarm in normal course. However the operator shall have the option of calling up the temperature measured by the specific detector as and when required.

7.0 MANUAL CALL STATIONS :

- 7.1 The manual stations shall be a press to break type. The device shall be red in colour and suitable for surface or flush mounting. Manual stations shall be interfactable to an addressable monitor module that can be accommodated within the device. The manual station shall have normally open fire alarm and annunciator contacts and these contacts shall close on activation. Contacts shall remain closed until station is manually reset.
- 7.2 The Manual Call Station shall be fully addressable with its own addressable module and operated by digitised signals from the FACP. The voltage range shall be from 17V to 31V. It shall have protection as per IP33. The operating temperature range shall be from 0 degree C to 50 degree C. Relative Humidity (non condensing) range of performance parameters shall be between 0 to 95%. Further, it shall conform to BS 5839 or EN 54/FM/UL/LPCB.

8.0 FIRE ALARM REPEATER / ANNUNCIATOR PANEL :

- 8.1 The Alarm Repeater/Annunciator Panel shall display fire/fault messages simultaneously with the FACP. It shall be capable of interfacing with the FACP on a single RS 485 Bus. The panel shall be capable of operating on 24 V DC supply.
- 8.2 The panel shall have a 2 x 40 character backlit alphanumeric LCD display which shall display date, time & description of alarm/trouble events that are displayed in the FACP with an inbuilt buzzer to indicate fault/fire alarm.
- 8.3 The panel shall be powered from the FACP.
- 8.4 It shall have control keys for Sound, Silence, Mute and to Reset the FACP from the repeater station.
- 8.5 The repeater panel shall have the following LED 's indications
- a. Supply
 - b. Fault
 - c. Mute
 - d. Silent
 - e. Disabled
 - f. Fire

9.0 HOOTER :

- 9.1 The hooter shall be addressable electronic type and shall give discontinuous/ intermittent audible alarm whenever any detector or call box operates. It shall be possible to control the

Hooter audible alarm in case it is not required to sound the alarm except for the FACP.

9.2 It shall be complete with electronic oscillations, magnetic coil (sound coil) and accessories ready for mounting (fixing).

9.3 The sound output from the Hooter should not be less than 85 decibels at the source point.

10.0 FIRE ALARM SYSTEM TESTING :

10.1. FACP :

- a. The FACP shall be checked for basic tests such as visually checking input voltage and amperage. All zones one by one shall be de wired to check for fault signal indication in the FACP.
 - b. The Power Source shall be cut off and checked for stand by Supply from the Batteries. After six hours the FACP Source shall be switched on to check for auto switch over to the Mains mode.
 - c. Tests shall be conducted for AC fail, charger fail, DC fail, Battery Disconnect or Battery fail. In all such cases the relevant L E D should glow and the piezo sound shall also give sound output.
- 10.2 The Analogue Addressable Fire Alarm System shall be tested as per the following schedule. Additional testing, as decided by the Owner shall also be carried out by the Bidder.

10.3. PHOTOELECTRIC TYPE SMOKE DETECTOR :

- a. The testing shall be carried out for each loop / zone, initially one detector in a zone and subsequently 2 or more disassociated detectors in each zone with time lapse between the detectors to test for Alarm Priority, Alarm Queuing and Call Logging.
- b. An identified detector will be subjected to smoke aspiration from burning paper/cigarette puffs, rubber and other materials which give dense smoke held at 0.3 M distance from the detector. The FACP should indicate increased analogue output for that address and after the programmed delay time, a fire alarm signal shall be indicated. This delay shall be utilised for alarm verification.
- c. The same test shall be carried out for two detectors in the same Loop but in different rooms. The FACP shall indicate Pre Alarm higher analogue levels for both detectors in its display with separate identification for both fires. One of the detectors in question be subjected to higher and longer levels of smoke aspiration. The FACP should give priority alarm for this address. The printout shall indicate individual addresses of the detectors with achieved analogue values and the time of event.
- d. This test shall be carried out for different Loops as well as for 2 Loops simultaneously.

HEAT DETECTOR :

- a. The same tests in the same sequence shall be carried out for this Detector but with the application of heat from a hair dryer held at approximately 60 cm distance.

10.5. COMBINED TEST :

- a. The next test will be in combination of Photoelectric / Heat Detectors simultaneously with time

lapse between application of smoke or heat or as required by the Client.

1.1.4.1.1

10.6. ADDITIONAL TEST :

- a. One detector of each type will be disconnected and subjected to slow dust build - up by means as desired by the Bidder and again connected in the circuit.
- b. The FACP shall indicate the changed ambient levels and automatically adjust the analogue values for the same. These Detectors shall then be replaced by new Detectors of identical type and the FACP shall then be programmed accordingly and checked. The Bidder will take custody of the removed detectors without additional cost to the Owner.
- c. Any part of the Loop shall be short circuited. The FACP shall indicate the communication failure of all the devices connected in the short circuited segment. After the short circuit is corrected, the Fault Isolator shall return to its normal status automatically, this being reflected in the FACP. The Loop shall then be in normal operation again. Any part of the Loop shall be de wired and tested as given above.

10.6.1. All other tests as required by the client at the time of handing over.

1.1.4.1.1.1 FIRE ALARM CONTROL PANEL

Type	: Analog Addressable
Type of display	: LCD
Display of	: ALL EVENTS
Addressable capability	: 126 detectors/loop
Intelligent capability	: Yes
Fault-isolation capability	: Yes
Alarm delay capability	: Yes
Sensor-self-test capability	: Yes
LCD display	
a. Type	: 2 Lines, 40 character on each line
BAS integration capability	: Yes
Stand-by battery with charger	: Yes
Voltage requirement	: 230 V 50 HZ - A
Listings	: To Comply with BS 5839 Pt 4 /EN 54/ UL
No of Zones	: 80
No. of Loops	: 15

1.1.4.1.1.2 SMOKE DETECTOR

Type	: Analog Addressable
Twin LED indication	: Yes
Blinking LED facility	: Yes
Addressable capability	: Yes
Intelligent capability	: Yes

Remote/Local test capability : Yes
Sensor Coverage : Spot Detection
Programming of detector : By means of a handheld programmer/ Decade Switch
Operating Temperature Deg C : -10oC to 50oC
Operating RH at 40o C : 95% RH
Operating Voltage : 17V - 31V
Power Consumption : < 300 Micro Amps
Listing : UL/LPC

1.1.4.1.1.3 HEAT DETECTOR

Type : Analog Addressable
Twin LED indication : Yes
Blinking LED facility : Yes
Addressable capability : Yes
Intelligent capability : Yes
Remote/Local test capability : Yes
Programming of detector : By means of a handheld programmer/ panel
Operating Temp. Deg C : -20o C to 88o C
Operating RH at 40o C : 95% RH
Operating Voltage : 17V - 31V
Power Consumption : < 400 Micro Amps
Listing : UL/ LPC

1.1.4.1.1.4 FAULT ISOLATOR MODULE

LED indication : Yes
Operating Voltage : 17V - 41
Power consumption : < 150 Micro Amps

1.1.4.1.1.5 MANUAL BREAK GLASS INPUT MODULE

Type : Analog Addressable
LED indication : Yes
Operating Voltage : 17V - 31 V
Power consumption : < 250 Micro Amps

APPROVED MAKES OF EQUIPMENTS:

Fire Alarm Control Panel	:	Edwards, Notifier, Morley
Smoke Detector	:	Edwards, Notifier, Hochiki
Heat Detector	:	Edwards, Notifier, Hochiki
Fault Isolator Module	:	Edwards, Notifier, Hochiki
Manual Break Glass Input	:	
Module	:	Edwards, Notifier, Hochiki
Cable	:	Neoflex, Finolex, Geoflex

1.1.4.1.2

1.1.5 TS 9 : FIRE EXIT ALARM SYSTEM

A Fire exit alarm system shall be designed basically to monitor the fire exit doors. During normal conditions, the fire exit doors shall be kept closed. The System shall consist of Magnetic contacts, PIRs, Computerised Multi function alarm control panel and interface modules.

The Magnetic contacts shall be provided at each fire exit door to detect the movement of doors. When any of the fire exit door is opened, the same shall be reported to the control panel and the sounders shall be switched on. The Fire exit doors shall be opened only from inside the premises and not from outside.

Control Panel

The control panel shall be Computerized 64 zone multiplex security controller with a facility to add on dialer and speech processor. The system shall be programmed, armed or disarmed through a control key pad. The control key pad shall have a 16 character LCD display for viewing various events. The code to arm or disarm the system shall be changed only by entering a master code.

The system shall have 64 zones and all the detectors shall be connected through a 6 core cable. Each area of the premises shall be divided into specific zones such that any zone shall be isolated by the user if required. The entire system shall be backed up by a maintenance free rechargeable battery to take care of system's power requirements whenever power fails. The system shall be totally tamper proof and shall activate an alarm if the control panel is opened, the sensors tampered with or if the system cables are cut even in the disarmed state. The system shall log 500 events and optionally printer shall be connected for generating reports.

Panic Bars are to be provided for each fire exit door. The Panic Bar should be aesthetically designed preferably with Stainless Steel finish. The Panic Bar should be installed on the protected side of the fire exit door and on operation of the Panic Bar, the fire exit door should open and an alarm should be generated at the control panel.

Multi I/O Module

The Multi I/O Module should have 8 zones input and 4 output zones each to be identified uniquely at the control panel.

Technical Specifications :

No. of Zones : 64

Events	:	500 event log
Control keypad	:	20 button illuminated keypad
Display	:	16 Character LCD on control keypad
On board outputs	:	4 Darlington driver outputs 2 bell / siren outputs
Temperature Range	:	-10 deg C to +55 deg C
Humidity Range	:	0% - 90% (non condensing)

1.1.5.1.1.1 APPROVED MAKES OF EQUIPMENTS

Control Panel	:	Ademco, Sentrol, Europlex
Panic Bar	:	Locknetics, SDC, Novafab
Magnetic Contact	:	Ademco, Sentrol, Seco Alarm
Passive Infra Red Detectors	:	Seltron, Ademco, Visionic
Cable	:	Neoflex, Finolex, Geoflex

1.1.6 TS 10 : CENTRAL CHANNEL MUSIC CUM PAGING SYSTEM

Centralised Channel Music System shall be located in the – Control Room of the Hotel and shall distribute 4 sources of music for the various restaurants and public areas. It shall be possible to select the type of music and set its level in any area locally.

The system shall consist of music sources (CD's Tape Decks – Satellite Receivers) connected to a central controller (microprocessor based). The outputs shall have audio amplifier zone (area) wise. Each unit shall have 6 zones and for source selection and sound level settings shall be installed in the zone (area). The connection between this panel and the central controller shall be a 4 core cable (CAT 3 or equivalent).

Change Over Switch : The Restaurants and function rooms shall have localised music system. Thus, additional Change Over Switcher Console shall be provided. These shall enable the switch over from the Local of the CENTRAL Music Sources.

Accoustical Calculation : for reverbation time shall be carried out for the various spaces. The calculations for absorption as well as reflective areas shall be recommended for the surfaces.

1.1.7 MUSIC SOURCES

a) CD PLAYERS – MULTI CD

Multi Play CD Player

25 CD

Freq Resp : 2 – 20 KHz.

S/N Ratio : 98 dB min

Harmonic Distortion : less than 0.005%

Wow & Flutter : less than .001% (EIAJ)

Makes : Sony, Pioneer, Denon

b) TAPE DECK – DOUBLE DECK – AUTOREVERSE

Cassette Tape Deck
Stereo Cassette Deck
4 Track, 2 Channel
Double Decks
3 head / 2 motors
Tape speed : 4.8 cms/s
Wow & Flutter : 0.18% (WRMS)
Dolby N/R
Freq Resp : 40 – 14 Khz (Normal)
Makes : Technics, Denon, Yamaha

CONTROLLER (MULTI SOURCE – MULTI ZONE)

- a) CONTROLLER
- b) CONTROL PANEL

AMPLIFIERS

Amplifiers PA

Rated Power : 240W @ 8 ohms

THD : less than 0.05%

Freq Response : 10 Hz to 30 Khz

Output : 0-4-8 ohms & 70 V line

Makes : Peavey / Studiomaster (with o/p TxS)

CABLES IN M.S. CONDUITS

- a) SPEAKER CABLES : Twin twisted AWG 12 – AWG 14
- b) Audio Signal Cable / Microphone Cable . Shielded Mic Cables.

Makes : West Penn, Belden, Saxton

- a) INTERCONNECT CABLES

1.1.8 MONITOR SPEAKER 2 WAY 40 WATTS

1.1.9 HARDWARE

- a) Wall / Floor Plates
for A – V Signal Connection
RCA / BNC & VGA for Data
- b) Conduits for Cables
(As per electrical tender)
- c) Audio Patch Panels & Patch Cords

d) Equipment Rack

Emergency Evacuation System : The entire Hotel shall be provided with emergency evaluation Public Address System and carcalling system.

A1 Emergency evacuation system consist of centralised amplifier rack with distributed speaker system. The speakers shall be connected on a 70 / on 100 V line.

The system shall consist of all over ride facility to 'down' the outputs from the Central Music System, distributed TV System. It shall have on signal oscillator output announcing on emergency. The microphone at Security System (for announcement) shall, however, have priority over the signal oscillator / microphone being manual Resc to Talk Switch on a VOX (Voice oua Music (Signal)) facility).

The emergency evacuation speakers (two numbers) in the guest room shall be connected to the main speaker on 70 / 100 V line.

A2 Emergency Evacuation :

1. Microphone – with Reso to talk switch Dynamic
Makes : Akg, Vutec
2. Amplifier
Amplifiers PA
Rated Power : 240W @ 8 ohms
THD : less than 0.05%
Freq Response : 10 Hz to 30 Khz
Output : 0-4-8 ohms & 70 V line
Makes : Peavey / Studiomaster (with o/p TxS)
3. VOX : switching unit
4. Speaker Cables
 - a) SPEAKER CABLES : Twin twisted AWG 12 – AWG 14
 - b) Audio Signal Cable / Microphone Cable Shielded Mic Cables.
Makes : West Penn, Belden, Saxton
- 4.1 Microphone Cables
- 5.0 Speakers : Cabling mount 6" full range
Feq : Response 100 – 15 K Hz
Power Handling 10 Watts
Sensitivity 89 dB
Sarpe Dance 4 ohms
Ceiling grill – flush mount
Enclosure – for speaker 10 watts R – cne
Makes : Atlas s 0 – 70 – 100 V
- 6.0 Hardware
Equipment Rack – DIN

B1 CARCALLING SYSTEM :

Shall comprise of microphones located at main hotel entrance. It shall have cable loads wiring to the amplifier rack located in the Central Control Room. The amplifiers shall have on input interface with the EPBAX system thus enabling the signal input for telephone at reception, bell captain. The voice signal from the telephone shall be by means of a code entry only (any). Thus it shall be possible to announce by means of (a) Miicrophone or (b) telephone

The speaker shall be located in the car parking areas and drive way of the hotel. These shall be all weather outdoor type.

- B2
1. Microphone with PTT switch Dynamic
 2. EPBAX interface (based on EPBAX)
 3. Amplifier
Amplifiers PA
Rated Power : 240W @ 8 ohms
THD : less than 0.05%
Freq Response : 10 Hz to 30 KHz
Output : 0-4-8 ohms & 70 V line
Makes : Peavey / Studiomaster (with o/p TxS)
 4. Speakers - 2 way
- Feq. Response – 100 – 15 K Hz
- Power Handling 89 dB
- Enclosure – all weather
Make : Atlas Sourdolia, TDA, Quarn
 5. Cables

CENTRAL SOUND EQUIPMENT :

Equipment shall cover all functions required for sound distribution in public areas.

Central modulation and amplification equipment shall be housed in metallic cupboard sound system rack.

Items of equipment shall be as per B.O.Q.

LOUD SPEAKERS :

Sounds shall be piped into the rooms from central control rack, with multiple zone transmission provided for piping of pre-recorded continuous music, announcements or messages. Loud Speaker shall be of embedded type, to be built into the false ceiling.

CABLE FOR SOUND EQUIPMENT :

Single pair i.e. 2 core cable of size 1.5 sq.mm. or similar sizes shall be provided for connection of loud speakers and outlets from the central sound equipment.

TS 11 : D.G. SET

1.0 SCOPE :

Scope of this section comprises the, installation, testing and commissioning of diesel generator set and ancillaries as per specifications, bill of quantities and drawings.

This specification covers the design, performance, manufacturing and testing of 1 No. 625KVA D.G.

Set with Panel comprising of all the ancillaries as mentioned in Specific Requirement and transportation to M/S Novartis Enterprises Limited, Turbhe.

The D.G. Set shall be Heat Exchanger cooled, compact with Low Noise Level, Fuel efficient and designed to meet International Emission Regulations (e.g. TA-Luft).

1.1 **ENGINE :**

The Engine shall be suitable for high speed diesel as per IS:1460 or Equivalent International Standards for continuous duty rating of 24 hours per day and shall be vertical four cylinders, four-stroke cycle, water cooled, natural aspiration, turbo-charged for power outputs of rated KW at 1500 rpm, 50 HZ after deration for TS 16 condition, with an overload capacity of 10% for one hour in any 12 continuous hour operation. The engine shall be complete with the following accessories :

Flywheel with ring to suit flexible coupling; coupling with guard; oil bath type air cleaner; corrosion resistant, heavy-duty radiator with blower type fan; water pump; PT/PTR type fuel pump; electronic governer; fuel filter; lube-oil pump; lube-oil filter; lube-oil bypass filter; hospital type exhaust silencer with piping; 24V, 20A DC starter; battery charging dynamo with in-built regulator; water separator; start switch key; water temperature indicator; lube oil pressure indicator; lube oil temperature indicator; engine fault indicators; low fuel oil alarm and engine running hourmeter on a panel suitably mounted on the engine generator block.

Automatic actuating type safety controls to stop the engine shall be supplied. Safety Controls shall be for low lubricating oil pressure, high jacket-water temperature, engine overspeed, engine overcrank, high winding temperature of generator etc. Fault indicator panel for these safety controls shall be suitably mounted on the engine generator block.

In order to keep the engine ready for start-up, thermostatically controlled, immersion type engine coolant heater shall be provided to maintain the temperature of engine block within the range of 50 to 60 deg. Celsius. The heater shall be mounted on the engine and shall be suitable for operation on 240V, single phase, 50 HZ A.C. Supply. Starting aid shall also include supply of lube oil pressure switch for automatic cutout on start of engine.

Lubrication system for the engine shall have a gear-type lubricating oil pump to supply oil under pressure to main bearings, crank pin bearings, pistons, timing gears, cam shaft bearings, valve rocker mechanisms etc. Separate pump shall be provided to operate at set intervals to lubricate various parts. Necessary timer controls shall be supplied in the control panel for lubricating oil pump. Threaded spin-on type fuel flow lubricating oil filters shall be supplied with spring loaded bypass valves to ensure oil circulation when the filters are clogged.

Engine shall be supplied with removable wet type cylinder liners and replaceable dry type air cleaners. Cylinder liners shall be of close grained alloy steel. Starting of diesel engine shall be by electrical (battery) starting system as specified in data sheet. Batteries shall be supplied with D.G. Set. Electrical Starting System shall comprise of starter, motor, batteries and battery charger and all the necessary instruments and accessories. Capacity of batteries shall be sufficient to give five cold starts.

Air intake filter shall be provided. Exhaust system shall consist of an exhaust gas driven turbocharger, exhaust gas silencer, necessary piping adapters, etc. Silencer should be of Residential Type. It shall also include Flexible Bellows.

Governor shall be provided for keeping constant speed within certain limits with variable load. Governor shall have following features :

Governor speed drop shall be adjustable between 3.5% to 4% of the nominal speed at any load upto full load. The nominal speed shall be adjustable by $\pm 5\%$. The rate of frequency variation shall not exceed 0.5Hz in every second. An overspeed trip mechanism shall be provided to automatically cut-off fuel in case the set reaches 120% of rated speed and mechanical stop push button shall be provided for tripping the engine.

Governor shall be Electronic type. Flexible coupling with guard. RPM indicator/Tachometer and Tachogenerator to trip DG Set during overspeed.

Following instruments shall be provided :

- a. 100-150mm diameter Dial Type indicator with alarm & trip contact for following :
 - Lub oil temperature guage in sump.
 - Lub oil pressure.
 - Jacket water temperature.
- b. 100mm diameter Pressure Guage at : Discharge of all lube oil pump.

First fill of lubricants shall be provided by Vendor.

Approved Makes : MTU, CATERPILLAR, Volco Penta, Deutzag, Cummins.

1.2 **ALTERNATOR** :

Alternator shall be designed for rated voltage, etc. as indicated in the data sheet and with Class 'F' insulation. The alternator shall be screen protected, drip proof, self-ventilated, self-excited, self-regulated with brushless excitation.

Field winding shall be fully insulated from the core. Field system shall have low inductance to allow good voltage regulation. Shunt regulator and automatic voltage regulator shall be provided.

Balance 3-phase compounding shall permit the alternator to supply unbalanced loads.

The alternator shall be suitable for supplying unbalanced loads to the extent of 25% of the rated current in one or two phases without injurious heating of any part, provided the rated current is not exceeded. Voltage unbalance consequent to 25% unbalanced load between phases shall not exceed $\pm 2\%$ of average terminal voltage, provided the power factor in any phase does not fall below 0.8.

Alternator field excitation shall be performed by a rotating exciter mounted on the alternator rotor shaft through a brushless rotation diode system. Solid state voltage regulator with SCR control shall be provided in the control cabinet. Voltage regulator shall be supplied with built-in rheostat for $\pm 10\%$ voltage adjustments.

Frequency regulation from no-load to rated load shall be in accordance with that defined for the engine governor (below). For any addition of load upto 90% of rated load, the frequency shall recover to the steady state band within 7 seconds. For any addition of load upto and including 90% of rated load, the voltage dip shall not exceed 10% of rated voltage. Voltage shall recover to and remain within the steady state band in maximum 5 seconds.

Alternator shall be of brushless, revolving field type, coupled directly to the engine flywheel through flexible driving disc for positive alignment. Housing of the alternator shall have a single ballbearing support for the rotor. The rotor shall be dynamically balanced for 25% overspeed.

Guaranteed performance of the alternator shall include the voltage regulation from no-load to rated load within a band of $\pm 1\%$ of within a band of $\pm 0.50\%$ of rated voltage. Steady state frequency modulation shall not exceed 1 HZ.

The Alternator shall be suitable for continuous duty rating of 24 hours per day and of enclosed fan cooled construction. The alternator shall have power output of rated KW at 0.80 power factor, 415V, 3-phase 4-wire, 50 cycles per second, 1500 rpm.

Alternator shall be drip proof construction and shall have suitable fan for cooling. Temperature rise shall be within the prescribed limits of class 'F' insulation, when feeding a 10% overload for one hour during every 12 hour Run on full rated load with the cooling air at an ambient temperature.

Line and neutral ends of each phase winding of Generator shall be brought out on six suitably located terminals. The size of the cables (provided by the Purchaser) is indicated in Data Sheet. Vendor shall provide suitable clamping arrangement for connecting the cables to the terminals. Terminals shall be suitably enclosed to prevent short circuits by rodents, etc. Suitable cable glands shall be provided on the enclosures to facilitate entry of the above cables. Inspection covers to be provided for terminal block.

240V, 1 phase space heater shall be provided in the lower part of the stator frame. The arrangement shall be made such that space heater shall be cut out automatically, when the alternator starts running.

Alternator shall be provided with 2 Nos. earthing terminals, which shall be separated from the neutral terminal. Neutral shall be brought out to fully insulated terminal. Alternator shall be with externally regulated rated voltage and with $\pm 3\%$ frequency variation.

Approved Makes : Leroy Somer, Stamford, KEC.

1.3 ENGINE GOVERNOR :

The Governor shall be Electronic and shall maintain the engine speed at precise isochronous control for rated frequency operation. Frequency at any constant load including that at no-load shall remain within a steady-state band-width of $\pm 0.25\%$ of rated frequency. Governor shall not permit frequency modulation to exceed one cycle per second.

1.4 AMF PANEL :

The AMF Panel shall be totally enclosed, indoor floor mounting, cubicle type of sheet steel construction with hinged door having removable gland plate and shall be suitable for starting the D.G. SET in case of power failure sensed by sensing Contractor. The Panel shall comprise of the following :

1 No. Siemens make Microprocessor based A.C.B. suitably rated, with overload, under-voltage & shortcircuit protection device.

1 No. Ammeter with selector switch.

1 No. Voltmeter with selector switch.

1 No. Frequency meter.

1 No. KWH meter.

1 Set. Indicating Lamps – 'SUPPLY ON' & 'LOAD ON'.

1 No. Digital Meter for voltage, current, KW, KVA, PF & Frequency.

1 No. Speed raise/lower switch/button.

1 No. Auto/manual selector switch with ON/OFF push buttons for manual operation.

ANNUNCIATION : Audio-visual Alarm and Shutdown in case of the foll :

- (a) Low lube oil pressure
- (b) High coolant temp.
- (c) Engine over-speed
- (d) Overcurrent & earth fault.

The Sensing Contactor will be connected to the General Lighting Panel of the building with a 4C 2.5sqmm copper armoured cable which will also feed mains supply for charging the battery of the D.G. Set.

The AMF Panel shall be designed to comply with the following requirements for automatic operation of D.G. Set in case of Mains Failure :

- a) Upon Mains Failure, the automatic control system shall operate to give a starting signal to the D.G. Set.
- b) As soon as the D.G. Set reaches its operating speed and the alternator reaches its operating voltage, the alternator contactor closes and connects the load on to the D.G. Set, thus restoring power supply through MCCB to the D.G. Panel.
- c) Three attempts starting facility shall be provided and in case the D.G. Set fails to start and reach operating speed within 25 seconds, the starting facility shall get disconnected & locked out automatically.
- d) When the mains supply has been restored to its normal characteristics for at least one minute, the load is automatically transferred to the mains supply and the D.G. Set is brought to rest.
- e) The D.G. Set is reverted to its stand-by condition and kept ready to start when the mains supply fails again.

1.5 FUEL TANK :

Fuel tank with capacity to store fuel required for 12 hours shall be provided with mounting brackets complete with inlet arrangement for direct filling and set of 10 ft. long hoses.

1.1.10 1.6 **ACCESSORIES**

1.6.1 BASE FRAME :

Base frame shall be sturdy, fabricated, welded channel construction, for mounting the above Engine and Alternator. Anti-vibration mounting pads shall be provided with the base frames.

1.6.2 SMF BATTERY :

Set of 24 Volts dry uncharged batteries with leads and terminals, to be charged by the Contractor while commissioning the set shall be provided.

1.6.3 MISCELLANEOUS :

- a) Safety control (trip) for Engine. - Overspeed with trip annunciation and visual indication.
- b) IDMT reley (2 pole overcurrent + 1 pole earth fault) with trip annunciation & visual indication.
- c) Trip annunciation & visual indication for :Low lube oil pressure High water temperature

1.7 FUEL OIL SYSTEM :

990 liters capacity fuel oil day service tank with mounting brackets complete with levelindicator, fuel inlet/outlet/vent/drain plug/quick fill connections fuel hoses upto 5M length shall be supplied an installed as shown on the drawing.

Bulk fuel oil storage tank is not included in the scope, as the fuel is proposed to be stored in standard

drums.

1.8 COOLING WATER SYSTEM :

Cooling water system shall comprise of cooling water circulation pipes, pumps and shall be connected to the Cooling Tower of HVAC System.

SITE CONDITIONS :

Ambient Temperature	:	45 degreeC (Maximum)
Altitude	:	Less than 1000 M above MSL
Humidity	:	90% (Maximum)

1.9 DEVIATION :

Any deviation in the equipment offered shall be clearly brought out in the offer. In the absence of such deviation, it will be presumed that equipment offered is exactly as per the specification.

1.10 COMPLETENESS OF DATA :

Vendor must give his offer with complete required data together with the drawings and leaflets.

1.11 CODES AND STANDARDS :

Diesel Generating Set with all its components shall comply with latest applicable statutes, regulations and safety codes in the locality, where this equipment will be installed. The equipment shall conform to the following standards (latest editions) :

IS:10000	:	Type testing of constant speed internal combustion Engines for general purposes.
IS:10002	:	Performance of constant speed internal combustion Engines for general purposes.
IS:1460	:	Specification for diesel fuels.
IS:4722	:	Rotating electrical machines
IS 4691	:	Degrees of protection provided by enclosures for rotating Electricity machine

1.13 PERFORMANCE REQUIREMENTS :

Unit shall be capable of starting from cold condition. Units shall be capable of peak output of 10% in excess of the rated output for a period of one hour out of a total of 12 consecutive hours of operation, without exceeding permissible temperature limits and with a fairly visible exhaust.

1.14 CONTROL PANEL : Control Panel shall be as per data sheet.

1.15 PACKING AND DESPATCH :

Unit shall be packed suitably to facilitate installation and transportation. During transport, care shall be taken to avoid damage to paint or accessories of the equipment. If any damage is caused during transport, vendor shall repair the same free of cost.

1.16 TESTS :

Following tests shall be carried out on D.G. :

- 1.16.1 Test Bench \readings for engine as per IS : 10000 and 10002, like fuel consumption tests, 24 hours running tests, etc.
- 1.16.2 Routine tests for alternator as per IS : 4722 or other applicable IS like insulation resistance test, high voltage test, etc. Load test from 0-110% shall be carried out for 30 minutes.
- 1.16.3 Vendor shall perform the following tests at site to the satisfaction of purchaser, if required.
 - 1.16.3.1 Governor response.
 - 1.16.3.2 Voltage regulator response.
 - 1.16.3.3 Vendor shall submit six copies of routine tests and type test certificate for approval before despatch.

1.17 INSPECTION :

- 1.17.1 Inspection including witnessing tests will be carried out by purchaser or his authorised representatives using instrument with Valid Calibration Certificates.
- 1.17.2 Vendor shall notify purchaser or his authorised representatives in writing at least seven (7) days prior to vendors scheduled inspection tests.

1.18 GUARANTEE :

Vendor shall guarantee design, materials, workmanship and performance for a period of 12 months from the date of initial operation or 18 months after delivery at site of all goods supplied under order, whichever date shall first occur.

1.19 DRAWINGS :

- a. Vendor shall submit 2 sets of outline dimensions, panel dimensions etc. along with offer.
- b. Vendor shall submit four prints of following for approval : (2 weeks from date of LOI)
 - i) Outline dimensional drawings with general arrangement.
 - ii) Piping flow sheets and piping layout.
 - iii) Electrical wiring and schematic diagram along with cable schedule and general arrangement drawing for control panel.
 - iv) Foundation drawings.
 - v) Fuel oil system with instrumentation and control with write-up.
 - vi) Lub oil system with instrumentation and control with write-up.
 - vii) Jacket water scheme with instrumentation and control with write-up.
 - viii) Governor system and voltage regulator write-up.
 - ix) D.G. Set instrumentation and control system with write-up.Vendor shall also provide three sets of installation, operating, maintenance and major overhauling instructions manuals before inspection.
- c. One print of each drawing will be returned to vendor after making all necessary corrections, changes and required clarifications. Vendor shall incorporate these and send within fifteen (15) days six prints of each drawing marked "CERTIFIED FOR RECORD AND USE" and one copy of Transparency Tracing of all documents.

d. Enclosed data sheets indicates detailed technical and quantity requirement.

1.20 TOOLS AND TACKLES :

Vendor shall provide required set of vibration pads, foundation bolts, nuts, washers necessary for erection, testing and commissioning.

1.21 TESTING AND COMMISSIONING AT SITE :

Vendor to make visits to site to instruct Customer / Electrical Contractor with regard to installation of DG Set and auxiliaries. Also testing and commissioning will be carried out by the supplier.

1.1.10.1.1.1.1 SPECIFIC REQUIREMENTS / DATA SHEET FOR D.G. SETS

1.0 GENERAL :

1.1	Rating	:	625KVA
1.2	Quantity	:	1 No.
1.3	Ambient Temperature :	:	45 degreeC (maximum)
1.4	Altitude	:	Less than 1000 M above MSL
1.5	Humidity	:	90% (Maximum)

2.0 DIESEL ENGINE :

2.1	Model No.	:	(* to be filled by vendor)
2.2	Rating	:	(* to be filled by vendor)
2.3	Duty	:	Continuous at 100% load.
2.4	Governor	:	EFC
2.5	Operating Speed	:	1500 RPM
2.6	Engine Starting	:	Battery
2.7	Type of cooling	:	Radiator and Fan

3.0 GENERATOR :

3.1	Rating	:	625KVA
3.2	Voltage	:	415V, 3 Phase-4 Wire
3.3	Frequency	:	50 Hz
3.4	Class of Insulation	:	Class 'F'
3.5	Type of enclosure	:	SPDP
3.6	Excitation System	:	Brushless, self-excited, self-regulated with AVR
3.7	Neutral Earthing	:	Solidly earthed.
3.8	No.of main cable	:	1.1KV Grade, 4 Nos. 3.5C x 300mm2

AYFY

4.0 STARTING SYSTEM

4.1	Manual / AMF	:	AMF
4.2	Starter	:	Electrical
4.3	Compressed Air/ Battery System	:	Battery Starting

5.0 ENGINE CONTROL PANEL

- 5.1 Engine Starting : Switch with Key
- 5.2 Guages (150dia) : a. Lub oil Temperature Guage
b. Lub oil Pressure Guage
c. Water Temperature Guage
- 5.3 Meters : a. Running Hour Meter
b. RPM Indicator
c. Battery Charging Ammeter
d. Battery Voltmeter
- 5.4 Alarms : a. Low Lub oil Pressure Alarm
b. High Water Temperature Alarm
c. Low oil level in Day Tank.
- 5.5 Trips : a. Low Lub oil Pressure
b. High Water Temperature
c. Engine over speed
- 5.6 Annunciator Pane; and others shall be as per
General Specifications : (12 window annunciator panel to be Provided)

All control wiring inside the control panel shall be carried out with 2.5mm² 650V Grade PVC insulated copper wires, D.G.Set power and control cables for sizes indicated on the data sheet.

- 6.0 GENERATOR CONTROL PANEL : 1 No.

Separate panel for D.G.
Set shall be provided.

Panel shall be floor mounted Single front, fixed cubicle

Construction, dust and vermin

Proof, fabricated 14/16 SWG

CRCA sheet and furnished

With baked epoxy paint.

Space heater shall be provided in each panel.

Ref. Drg. No. 982119-EIB-01 Rev 1.

- 6.1 Panel shall comprise of following :
- 6.1.1 1 No. Incomer Feeder from D.G. shall consist of following :
 - a. 415V 1000A,35MVA, 4 pole draw out ACB (motorised) : 1 No.

having 240V AC closing & tripping Circuit. Spring ChargingMotor shall operate on 240V AC.

- b. 0-500V, 144mm² volt- : 1 No.
meter with voltmeter selector switch
- c. R,Y,B phase indicating : 3 Nos.
Lamps & fuses
- d. 0-1000A144mm² amme- : 1 No.
ter with ammeter selector
switch
- e. 1000A/5A/5A current : 3 Nos.
transformers for metering
& protection with
Core 1 : Class 1, 15VA, for
KWH meter with M.D.I.,PF
Meter, Ammeter with
Selector switch and KW
Meter.
Core 2 : Class 5P10, 15VA,
For CDG-31
- f. 'EE' make CDG-31 relay :
with 2 Nos. over current
element with 50-200%
setting

TS 12 : MATV SYSTEM :

The MATV System shall relay satellite programmes, programmes received from terrestrial transmission as well as in house Video Programmes. The system shall be designed for 10 channels expandable to 100 channels.

The system shall consist of C Band Dish Antennae and Yagi Antennae for off air transmission. The signals shall be routed to power dividers - on to a microprocessor controlled system of receiver / modulator with an in built combiner.

The signals from in house video shall be combined as well. Proper slope (Levels) shall be given to the various outputs on the different channel with due consideration to the lengths of signal travel. The design shall consider a at TV signal of 65 DB min.

The distribution system shall be as per the layout drawings.

- 1.0 Antennae
 - 1.1 Dish Antennae :
 - Band C – 3.7 – 4.2 Hz
 - Anodised Aluminium Mesh
 - Gain 40 dh
 - Mount : Az/EI
 - Mounting Facility : 360 deg in Azimuth & 10 deg. To 90 deg in Elevation Wind Load Survival : 80 K Mph
 - 1.2 Terrastial Antenna
 - Yagi
 - 3 element with diapole
 - for local reception.
- 2.0 LNBC C B and
 - 2.1 Input Freq. : 3.7 – 4.2 Mhz
 - Noise figure at 25 deg C : 2.5 deg. K
 - Output freq : 950 – 1450 Mhz
 - Power Gain : 65 dB
 - Output Impedance : 75 ohms
 - Operating Temo : 0 – 50 deg. C
 - Relative humidity : 100%
 - Input wave guide flange : CPR – 229 G
 - Output connector : F – type
 - Make : Gardiner, Scientific Atlanta
 - 2.2 Power Divider : 8 way
 - Freq range : 0.9 – 1.45 Ghz
 - Insertion Loss : 14.0 dB max
 - Isolation : 15 dB
 - Impedance : 75 ohms
 - Makes : DX, Maspro
- 3.0 Receiver / Modulator / Combiner Console
 - with Power Supply
 - Receiver : 950 – 1750 Mhz
 - Microprocessor controlled
- 4.0 Amplifier
 - Broad band
 - VHF - UHF
 - Output : 110 dB
 - Gain : 38 dB
 - Connector : F Type

	RG 6 U	RG 11 U
Dielectric	Foam	Foam
Centre conductor	1.02 mm	1.63 mm
Diameter over jacket	7.06	10.03
Line loss in dB per 100		
		TS 12/2
Mts at froq		
55 / oh 2	5.25	3.15
211 / ch 13	10.82	6.23
600	16.73	10.43

Makes : WestPenn, CommScope

6.0 Distribution Components

7.0 Signal Outlets

8.0 Signal Sources (In House)

8.1 VCR

Multisystem

3 head system

Makes : Sony, Panasonic or equivalent

8.2 Combi Players

DVD – VCD = LD

10 bit/27 MHz / processing video D/A convertor

Dolby Digital

Makes : Pioneer, Philips

8.3 Character Generators

Title Sroll Up/Dn

Memory 10 pages of titles

Palyback : sequential switcher

OR

PC with Video card & software

- 9.0 Hardware
- 9.1 Equipment Rack
 - 19" DIN rack for equipment

1.1.11 TS 13 : LIGHTNING PROTECTION

1.0 LIGHTNING ARRESTORS

The lightning arrestor system comprises of air terminations, earth termination and the interconnections between the two terminations as per IS : 2309 - 1969.

2.0 AIR TERMINATION

The air termination shall be provided at points shown on the drawings. The air termination shall consist of 20 mm dia. 750 mm long tapering electrolytic copper rod fitted to a four directional copper base plate grouted to the surface of roof. The air terminations shall be vertical type and shall be interconnected by 25 mm x 3 mm bare copper tape forming the roof conductor.

3.0 EARTH TERMINATION

The earth termination consists of an earthing station complete with copper electrode 600 mm x 600 mm x 3 mm. The earth termination shall be provided complete as described under 'Earthing' in this specifications.

4.0 INTERCONNECTIONS

The air terminations shall be connected to the earth termination by 25 mm x 3 mm copper tape. Copper taps shall be fixed to walls/columns by means of brass saddles and metallic fasteners as shown. Copper tapes of the longest possible lengths shall be used. Where joints in tapes cannot be avoided, the joints shall be tinned, soldered and double riveted with copper rivets. All joints shall be electrically and mechanically continuous and effective. Where the copper tape is to be laid underground it shall be laid 750 mm below the ground level, buried in trench, covered with a 100 mm thick layer, of sand and protected by bricks laid across the tape. All metallic parts of the building above the main roof level including ducts, louvers, pipe railings, gutters wire using terminal lugs and brass bolts.

Before starting work on the lightning arrestors system the contractor shall get approval from the Architect with respect of the location of termination and earth termination.

1.1.11.1.1.1.1 TS 14 : EXTERNAL LIGHTING

1.1 Scope :

The scope of work covers the supply, installation and testing of lighting poles, weather proof light fixtures, wiring to the fixtures, cable laying, earthing as specified and shown on drawings.

1.2 Standards :

- a) IS : 1913 - 1969 : General and safety requirements for light fittings.
IS : 2944 - 1981 : Code of Practice for lighting public thoroughfares.
IS : 3528 - 1966 : Water proof electric lighting fitting.
IS : 3553 - 1966 : Water tight electric lighting fitting.
IS : 1239 - 1958 : Mild steel tubulars and other wrought steel Pipe fitting.
IS : 2712 - 1978 : Luminaries for street lighting.
IS : 2149 - 1970 : Indian Electricity Act and Rules.
- b) All codes and standards mean the latest. Where not specified otherwise the installation shall generally follow the Indian Standard Codes of Practice or the British Standard Codes of Practice in the absence of Indian Standards.

1.3 Light Fixtures :

- a) The light fixtures construction shall be of die cast aluminium with a separate compartment for integral ballast equipment. The reflector shall be anodized polished aluminium. The glass refractor shall be heat-resistant.
- b) Lamp holder shall be of porcelain and shall comprise of a terminal block of non-hygroscopic material. The luminaries shall have integral ballasts housed in water tight and dust tight metal cases. Ballasts shall be prewired to the Lamp socket and terminal block, requiring only power supply leads to the ballast primary terminals.
- c) The Lamp & Luminaries shall generally follow the specification under section "LIGHT FIXTURES".

1.4 Lighting Poles :

- a) The lighting poles shall be fabricated from heavy duty cold-rolled steel tubes to IS : 1239 - 1958 and hot dip galvanised or painted specified. The pole shall have a base plate, a large access panel, and necessary fixture mounting bracket at top. The access panel shall provide easy access to a multiway porcelain connector and fuse board, to be mounted inside the pole. The access shall be specially fabricated with adequate reinforcement and weather gasket to prevent ingress of moisture and vandal proofed. Poles shall have large diameter entries for incoming and outgoing cable and two earth studs. The pole fabrication shall conform to the drawings and where such drawing is not available, the contractor shall make such drawing and have it approved before fabrication.
- b) The pole shall house a multiway porcelain terminal block and rewirable fuse as shown on the drawings. Pole shall have a concrete coping.

1.5 Cable Laying :

- a) Cabling shall be generally as specified in the section "CABLING".
- b) Cables shall be terminated in a 4 way terminal block inside the pole or attached therewith as shown on drawings.
- c) Cable route shall be as shown on the drawings or the contractor shall mark out the route and lay the cables only upon approval of the route.

1.6 Earthing :

All street lights fixtures and poles shall be earthed as specified under section "EARTHING".

1.7 Mode of Measurement :

- a) Each lights fitting with lamp, control gear, earthing etc. shall be considered one unit for measurement and payment.
- b) Each lighting pole, concrete coping, base plate earthing etc. shall be considered as one unit for measurement and payment.
- c) Wiring from the terminal block to the light fitting shall be considered as one unit for measurement and payment.
- d) All cabling work shall be measured on the basis of unit length and the cost shall include, cost of cable excavation laying and back filling, cable terminations in junction boxes or pole terminal box etc.

2.0 FEEDER PILLARS

All Feeder Pillars will be self supporting outdoor type fabricated out of 14 SWG M.S. sheets, welded to angle iron frame of required dimensions, fabricated out of 40 x 40 x 6 mm or 60 x 60 x 6 mm angle iron. Feeder Pillars have front openable hinged type lockable door. There should be no burrs and or no sharp corners / edges in the angle iron frame. Likewise drilled holed in the sheet metal should be cleaned and filed smooth.

Feeder Pillars will have sloping top cover extending on all sides, so as to protect the main housing from rain water. The overall size of the Feeder Pillar will be so as to accommodate the bus bar section as required and number of outgoing T.P./S.P. fuse units. The Feeder Pillars size should be such as to accommodate systematically arranged various cables.

The unit should be first treated for degreasing and phosphating. Then two coats of red oxide primer and two coats of POB red enamel paint. Preferably the unit should have oven finish. Feeder Pillars will be mounted on RCC (1:2:4) platform of required size and height.

The frame should have cross arms to mount fuse units (HRC - Type fuse). The cross arms will be out of 30 x 6 mm flats. The bottom plate of the Feeder Pillars will have adequate number and size knockouts for incoming and outgoing cables. There should be clear distance of 3 in. (75 mm) from the foundation / mounting bottom of the angle -iron frame to accommodate cable glands.

1.1.11.1.1.1.1.1.1 TS 15 : UNINTERRUPTED POWER SUPPLY SYSTEM

1.1 Scope

1.1.1 Scope of this section comprise the supply, erection, testing and commissioning of uninterrupted power supply system.

1.2 Requirements

1.2.1 UPS units shall be completely transistorised pulse width modulated.

1.2.2 It should act as an instantaneous sine wave controller having a sine wave output. Any dip in the voltage shall be fully recovered within 4 – 5 milli seconds.

- 1.2.3 Harmonic Distortions (THD) should not exceed 3%.
- 1.2.4 The system shall be able to handle Non Linear Loads. THD should not exceed a limit of 5% even when system gets loaded to 100% capacity.
- 1.2.5 Voltage variation should be within +/- 2% of the rated output voltage.
- 1.2.6 In the event of power failure it shall isolate itself from the MAINS to prevent sudden power surges and interfaces creeping into the system.
- 1.2.7 The output shall be regulated through an inverter bridge to avoid any loss.
- 1.2.8 Noise level shall be low and under no circumstance exceed 60 db from the operator.
- 1.2.9 The unit shall have all metal parts made out of white CRCA sheets of minimum 2 mm thick and shall be treated through seven tank process and shall be powder coated finished to Siemens grey shade.
- 1.2.10 UPS system shall be manufactured, assembled and tested to the finest degree and match the international product in operation.
- 1.2.11 UPS system shall include 15 minutes battery back up complete with all accessories.

1.1.11.1.1.1.1.2 TS 16 : VOLTAGE STABILIZER

1.1 Scope

1.1.1 Scope of this section comprises the supply, erection, testing and commissioning of Voltage Stabilizer, Servo controlled type with isolation transformer. Input and Output shall be single phase or 3 as per the Bill of Quantities.

1.2 Parameters and Controls

1.2.1 Voltage Stabiliser shall meet the following parameters :

- | | |
|---------------------------|---------------------------|
| a) Input | |
| 1 - Phase Models | 180 – 260 Volts |
| 3 - Phase Models | 360 – 460 Volts |
| b) Output | |
| 1 - Phase Models | Settable 220 – 240 Volts |
| 3 - Phase Models | Settable 400 – 430 Volts |
| c) Supply Frequency | 45 – 55 Hz |
| d) Output Regulation | +/- 1% |
| e) Over Load Capacity | UP to 25% for 3minutes |
| f) Output Wave Form | Sinusoidal, no distortion |
| g) Effect of Power Factor | Nil |
| h) Efficiency | Better than 95% |
| i) Ambient Temperature | Upto 55 deg. C |
| j) Environment | Indoor |

1.2.2 Controls and Indications shall be as follows :

- a) Main on indications
- b) Auto / manual switch
- c) Raise / lower push buttons for operation in manual mode.
- d) Automatic power cut off for under & over voltage.
- e) Voltmeter with switch to read input / output voltage.
- f) Output voltage adjustment.
- g) Under / over voltage indications.
- h) Remote audio / visual alarm. Ammetres

TS 17 : T.V. INSTALLATION :

1.1 Scope :

1.1.1 Scope of this section comprises the supply, erection, connection and commissioning of multi-channel television distribution network which covers the following :-

- a. Antenna
- b. Amplifiers
- c. Distribution cabling / wiring and connection from
 - (I) Antenna to amplifier
 - (II) Amplifier to distribution and adopters
 - (III) Distribution boxes to co-axial sockets.
- d. Co-axial sockets in rooms.
- e. Boxes and connection
- f. All accessories required for proper operation such as couplers, convertors etc. if necessary.
- g. Antenna supports.
- h. Adjustment, testing and commissioning of the installation to provide at each co-axial socket the desired signal strength as per standard recommendations. (Refer specifications of Society of Cable Radio and TV Relay Equipment or Indian Standards).

1.2 Master Antenna / Dish Antenna System :

- 1.2.1 Master antenna shall be of aluminium and anodised and mounted on masts.
- 1.2.2 2 Nos. Dish Antenna of size 12 feet dia parabolic shall be provided. This shall consist of satellite receiver, LNBC. control cable and wire mesh aluminium dish. This shall be suitable for operational temperature of 60 deg. C and shall have wind load survival of 80 Kmph.

1.3 Amplifiers :

- 1.3.1 Amplifier shall be transistorised type, the model and characteristics being defined by the Tenderer in relation to local reception and capacity of the installation.
- 1.3.2 If required by local reception conditions, Tenderer shall provide all convectors, preamplifiers, filters, channel couplers and splitting units etc. needed to provide signals of the correct level at all television points free from cross or intermodulation with a signal to noise ratio better than 42 DB on all channels. The received picture shall be free of ghosts, shadows or multipath reception.

1.4 Co-axial Cables :

- 1.4.1 All co-axial cables used should be low loss semi-air spaced copper tape and braid solid conductor for television distribution.
- 1.4.2 If the outside conductor is in the form of a braid this braid should be tinned or silvered to avoid oxidation.
- 1.4.3 The impedance characteristics of the cables should be 75 ohm.
- 1.4.4 Cables shall be low attenuation and non ageing type. It shall be able to feed 50 different frequencies simultaneously.
- 1.4.5 Cables shall be identified by means of a marker band ring and the correspondence reference be given on the diagram.
- 1.4.6 Cable shall allow easy connection to the boxes and amplifiers. They should therefore not be cut too short. The cable shall be connected to earth.

1.5 Co-Axial Socket :

- 1.5.1 Cable shall run in conduits concealed with a tail of about 2 m. A double, isolated coaxial socket of the wall type, matching the electrical fittings used in the room shall be installed.

1.6 Derivation Boxes :

- 1.6.1 All boxes, suprs and tee fittings shall be compatible with the impedance of the cable used.
- 1.6.2 Each box, suprs and tee fitting shall be capable of transmitting to the user on a single line all frequencies of the various programs used.
- 1.6.3 Boxes, suprs and tee fittings shall always be accessible both for installation and for essential repair.

1.7 Protection Against Interference and Parasite Signals :

- 1.7.1 The installation shall be carried out so that none of the sound or vision receivers can disturb reception in the adjoining room, either by interference or by the introduction of parasite signals of any kind in the distribution network.
- 1.7.2 Disconnection of several televisions shall not cause the installation to be disturbed.

1.8 Installation :

- 1.8.1 The work shall be executed in accordance with good engineering practice and as per rules and recommendations.
- 1.8.2 Material offered shall guarantee perfect operation.
- 1.8.3 The installation must be capable of transmitting colour programmes.

1.9 Earth Connection :

1.9.1 Earth line shall be atleast 2.5 sq.mm.

1.9.2 If the electricity installation earth connection is used, the connections to the antenna and amplifier must be separated from other earth connections.

1.10 Testing & Commissioning :

1.10.1 Testing of cable work shall be undertaken and faults rectified.

1.10.2 Contractor shall accept overall responsibility for proper operation of television network and must rectify any fault.

1.10.3 Commissioning of the whole installation shall be done in two stages.

(I) the Contractor shall check the signal strength at each socket and shall draw up a test report for submission to the Owners/Architect/Consultant.

(II) Reception will be checked by the Owner / Architect / Consultant or his agent and television set supplier who may ask for any additional tests they consider necessary.

1.11 Drawings :

1.11.1 The Contractor shall supply a layout drawing and distribution schedule showing the following :-

(I) Cable characteristics

(II) Position of ANTENNA MASTS

(III) Location of Amplifier

(IV) Location of deviation boxes, convertors, couplers etc.

1.11.2 The Contractor shall submit the distribution drawing before commencement of the work.

1.11.3 After completion, the Contractor shall supply six copies of as built drawings to the Owner Architect / Consultants.

TS 18 : CLOSED CIRCUIT TELEVISION SYSTEM :

1.0 GENERAL

The Closed Circuit Television System (CCTV system) shall provide an on-line display of video images on monitor. Cameras with suitable lenses should be used to view specific areas of interest. The primary objective of implementing a CCTV system is to ensure effective surveillance of the area and also create a record for post event analysis.

2.0 EQUIPMENT DETAILS

The CCTV System shall comprise of Dome Cameras, Auto Dome units Multiplexers, Matrix switcher and other associated accessories.

2.1 INTEGRATED DOME CAMERA UNIT

The Dome camera unit shall be 1/3" Monochrome CCD type and shall provide a minimum of 380 TV lines resolution. It shall be possible to use lenses of 3.8mm, 6mm focal length. The complete unit shall be housed in a dome and base unit, both made of preferably from injection moulded plastic. It shall be possible to adjust the camera head inside the dome in both the planes so that it can be wall or ceiling mounted. The camera shall operate on 12 volts D.C. The Dome camera shall comply with the specifications.

2.2 MONOCHROME CAMERA

The camera shall be of 1/3" format CCD type, compact of rugged design and shall employ solid state circuitry. The camera shall deliver clear, high resolution monochrome picture without geometric distortion. The Camera shall comply with the specifications.

2.3 AUTODOME UNIT

The Auto dome camera shall be aesthetically pleasing, compact and amazingly powerful and shall include high performance 1/3" / 1/4" Colour camera with fully functional Pan/Tilt / Zoom mechanism with 8X or 12X Zoom facility. The Auto dome unit shall operate over 358 deg pan rotation and 90 deg tilt. It shall be possible to execute the two movement at different speed which the operator can determine. It shall be possible to program 32 preset positions, which can be stored and recalled both manually and automatically. The 1/3" / 1/4" "Autodome camera shall comply with the specifications given.

2.4 DIGITAL VIDEO MULTIPLEXER

The digital video multiplexer shall provide multiplexed field recording of upto sixteen video inputs. The multiplexer shall offer selectable live multiscreen displays while recording to one VCR and simultaneous digital recording and playback when two VCRs are used. The unit shall provide one looping output for each video input. It shall provide one alarm input for each video input. Two light duty isolated contact pairs shall also be provided. The unit shall provide a user-programmable twelve character title for each camera and shall also record time and date with each video image.

The multiplexer shall feature dual monitor outputs. The primary or "main" monitor which shall display selectable full screen/sequencing full screen/ multiscreen video images while recording is taking place and selectable full screen/sequencing full screen multiscreen video when playing back previously recorded tapes. The secondary or "spot" monitor, shall display live full screen video from selected camera.

Live video and playback functions shall include the following selectable options: full screen from any camera, sequencing full screen from selected cameras, four-way "quad" screen display, nine-way split screen .

The multiplexer shall provide a digital freeze frame and 2X electronic zoom in full screen live and playback modes, including the ability to digitally "scan" each frame of video.

The multiplexer shall feature time base correction, eliminating the need for external camera synchronisation. The multiplexer shall feature an adjustable field delay schedule for

compatibility with virtually any VCR. The multiplexer shall be SVHS compatible for both the video recorder and main monitor.

The unit shall feature programmable digital activity detection on all video channels. The unit shall have selectable sensitivity for variations in scene type. Digital activity detection shall provide two selectable modes of operation: "exclusive" and "interleave". The "exclusive" mode of activity detection shall record images from only those cameras viewing activity. The "interleave" mode of activity detection shall prioritise the recording of those cameras viewing activity, while recording fewer images of non-active cameras.

The unit shall provide eight fully programmable function keys. Each function key shall be capable of performing a customised series of commands, to be executed with the touch of one key. The multiplexer shall have password protection via security access code.

2.5 MATRIX SWITCHER/TELEMETRY CONTROLLER

The Matrix Switcher shall be capable of taking upto 48 video inputs at present and expandable upto 64 video inputs and shall have atleast 1 monitor output and expandable upto 9 monitor outputs. It shall be possible to program 64 different types of sequences with variable dwell time. It shall be possible to set a minimum of 16 preset positions for each camera. The presets shall be used by the operator to monitor the entire area.

The system shall have programmable text inserter for all outputs. The matrix switcher shall be provided with joystick keyboards for Pan/Tilt/Zoom control of cameras through telemetry receivers via coaxial/twisted pair cable. The system shall support atleast 9 joystick keyboards. Each keyboard shall have different priority levels so that certain cameras are accessed by certain individuals only.

In place of keyboards it shall be possible to use a PC and activate all functions that are available on a joystick keyboard. Windows 95/98 based PC application software shall be available for the same. The System shall be interfaced to a PC.

2.6 TIME LAPSE VIDEO RECORDERS

The Time Lapse Video Recorder Provided shall work on 24 Hr. Time Lapse mode and shall have the following features.

- 1) Time /Date generation
- 2) Automatic restart of recording after power failure
- 3) Automatic Head cleaning facility
- 4) Alarm recording / Alarm search capability
- 5) Key operated mode lock for added security
- 6) One year time date backup
- 7) Single monitoring with power off
- 8) RS232 interface

2.7 MONITOR

Monochrome monitor

The Monochrome monitor shall be suitable with the standards of the selected cameras. It shall be solid state and modular in design. It shall provide a bright, clear and well defined picture display on the screen.

All controls for brightness, contrast etc. shall be provided on the front panel for readily adjusting the levels of the video signal. The rear panel shall be provided with input and output BNC connectors for coupling the video output to other Monitors. The video monitors installed shall be atleast 12 1/20 " size or more and shall comply with the specification.

COLOUR MONITOR

The Colour monitor shall be suitable with the standards of the selected cameras. It shall be solid state and modular in design. It shall provide a bright, clear and well defined picture display on the screen.

All controls for brightness, contrast etc. shall be provided on the front panel for readily adjusting the levels of the video signal. The rear panel shall be provided with input and output BNC connectors for coupling the video output to other Monitors. The video monitors installed shall be atleast 14" size or more and shall comply with the specifications.

3.0 **CABLE REQUIREMENT**

RG11 coaxial cable shall be used for transmission of video signal .Multi core control cable shall be used between the receiver and the Pan/tilt unit.

DC cable shall be used between the receiver and the zoom lenses.

2 x 1.0 Sq.mm twisted pair cable shall be used between telemetry controller and receiver.

3 core 1.5 sqmm AC cable shall be used to power cameras

All the cables shall be laid in conduits.

4.0 **EQUIPMENT POWER SUPPLIES**

All critical equipments such as cameras, pan/tilt unit shall be provided with a power supply of 230VAC.

Technical Specifications for 1/4" Auto Dome

Image Sensor	:	1/4 -inch color interline	transfer CCD
Active Pixels	:	752 (H) x 582 (V)	
Scanning Frequency	:	(H) 15.625kHz. (V) 50Hz.	
Minimum Illumination	:	9 Lux	
Synchronization	:	Internal	
Video Output	:	VBS 1.0 Vp-p/75 Ohms, BNC	
Lens Focal Length	:	f 4.5mm ~ 36mm (8 x Zoom)	
Maximum Relative Aperture	:	Wide 1:1.8, Tele 1:2.5	
Angle Field Of View	:	(Horizontal) x (Vertical)	
		f = 4.5 mm	42.2 deg x 33.7 deg

f = 36mm 5.8 deg x 4.3 deg

Minimum Focus Distance	:	1.5 m	
Mechanical-iris	:	Automatic (Maximum, F5.6, F11)	
Zoom Speed	:	Max 1.6 second from tele to wide	
S/N Ratio	:	40 dB	
Focus	:	Manual	
White Balance	:	Automatic	Electronic
Shutter	:	Automatic (1/50 ~ 1/10000) Fixed (1x100)	
Pan Rotation	:	+/- 180 deg.	
Pan Speed	:	9 deg., 18 deg., 90 deg. / sec	
Tilt Rotation	:	0 ~ 90 deg.	
Tilt Speed	:	9 deg., 18 deg., 90 deg. / sec	
Preset	:	16 positions	
Power source	:	DC 12V, External	
Power consumption	:	Max 20 VA	
Operating Temperature	:	0 ~ 40 deg. C 32 ~ 104 deg. F	
Relative Humidity	:	10 ~ 75% (there should be no Condensation)	
Storage Temperature	:	-5 ~ 55 deg. C 23 ~ 131 deg. F	
Storage Humidity	:	10 ~ 95%	

Technical Specifications for 1/3" Auto Dome

Image Sensor	:	1/3 -inch color interline - transfer CCD
Total Pixels	:	795 (H) x 596 (V)
Active Pixels	:	752 (H) x 582 (V)
Synchronization	:	Internal
Video Output	:	VBS 1.0 Vp-p/75 Ohms, BNC
Scanning Frequency	:	(H) 15.625kHz. (V) 50Hz.
Lens Focal Length	:	f 5.4 mm - 64.8 mm (12X Zoom)
Maximum Relative Aperture	:	Wide 1:1.6, Tele 1:2.5
Minimum Illumination	:	3 Lux
Resolution	:	480 TV lines

Interface	:	RS 485, BNC (Video)
S/N ratio	:	More than 48 db
White Balance	:	Automatic Tracing White Balance (ATW)/Manual
Back light compensation	:	ON/OFF
Focus	:	Auto/Manual
Electronic Shutter	:	Auto/Manual (1/50 to 1/10000)
Flicker less	:	Auto/Manual (Fixed 1/120)
Mechanical-iris	:	Auto
Pan rotation	:	360 deg continuos
Pan Speed	:	Manual 0.8 - 120deg. / sec (64 Steps speed) Presets 0.8 - 240 deg./ sec (64 steps speed)
Tilt rotation	:	-5 deg - 90 deg
Tilt speed	:	Manual 0.8 - 120deg. / sec (64 Steps speed) Presets 0.8 - 240 deg./ sec (64 steps speed)
Power source	:	DC 12V, External
Power consumption	:	Max 15 VA
Operating Temperature	:	0 ~ 40 deg. C 32 ~ 104 deg. F
Storage Temperature	:	-20 - 60 deg.C
Relative Humidity	:	10 ~ 75% (there should be no Condensation)
Storage Humidity	:	10 ~ 95%

Technical Specifications for Time Lapse Recorder

Resolution	:	300 TV Lines (monochrome) 230 TVL (colour)
Video Recording System	:	4 Rotary Heads Azimuth Helical Scanning System
TV System	:	625 Line 50 Field Pal
S/N Ratio	:	Better than 42dB
Recording Speeds	:	3, L12, L24, Hours (with E 180 Tape)

Audio recording	:	3, L12, L24
Tape Format	:	1/2" High Density VH
Power Supply	:	110-230 VAC +/- 10% 50/50 HZ
Power Consumption	:	20 Watts
Operating Temp.	:	5-40 deg. C
Battery Back Up	:	up to 31 Days

Technical Specifications for 14" Colour Monitor

Video	:	PAL / NTSC colour composite 1.0 vp-p
CRT	:	14" (36cm) diagonal, 0.66 mm stripe pitch
Resolution	:	More than 350 TVL
Power Input	:	110 - 260 VAC, 50/60 Hz
Consumption	:	50 Watts
Connections	:	Video : Line A & B, each 2 x BNC, (1 for bridged output : 75ohms and Hi-Z, switchable)
Controls	:	Power, brightness, tint, contrast input A or B, PAL or NTSC

Technical Specifications for 21" Colour Monitor

System	:	NTSC / PAL CRT 21" diagonal, 0.7mm stripe pitch 1.7 R flat type, 90 deg. Deflection
Horizontal Resolution	:	More than 450 lines
Input Signal	:	Video signal : 0.714 Vp- p (Composite 1 Vp-p) Sync. signal : 0.286 Vp-p
Subcarrier	:	3.579545 MHz +/- 400 Hz (room temperature)

Frequency	:	4.433618 Mhz +/- 400 Hz (room temperature)	
Horizontal	:	+/- 500 Hz	
Frequency Stability			
Vertical	:	+/- 4 Hz	
Frequency Stability			
High Voltage	:	25 kV +/- 1.5 kV	
Convergence	:	less than 0.1 mm (at the centre of display area)	
Power Consumption	:	75 Watts (maximum)	
Operating Humidity Condition	:	0 to 90%	
Operating Temperature	Range	:	0 to 40 deg. C
Audio	:	2 Watts	

Technical Specifications for Dome Camera

Image Device	:	1/3" CCD 512 (H) x 582 (V)
Sensitivity	:	0.6 lux @ F2.0
Resolution	:	380 TV lines Horizontal
Auto. Electronic Shutter	:	1/50 to 1/10000 sec
Input Power Source	:	12V DC
Power Consumption	:	less than 2 W

Technical Specifications for Multiplexer

System	:	Duplex
Record Modes	:	Multiplex record
Display	:	Full, 4,9 & 16-way
Multiplex Playback	:	Full screen single, sequencing quad or multiscreen
Multiscreen Record	:	Playback as recorded. Enlarge any area of Playback recorded image via zoom function
Activity Detection	:	Prioritises recording of important camera scenes
Scheduler	:	To change between preferred recording modes

Video Inputs : 16 camera inputs

Video Outputs : 1 Main monitor, 1 SPOT monitor & 1 VCR recording outputs

Camera Titles : 12 - character title

Alarm : optional : 16 inputs and 2 output

Power : 90 - 264 VAC, 50/60 Hz

Technical Specifications for Camera

Mode : CCIR

Pick up Element : 1/3 inch Monochrome CCD image sensor (inter line)

Number of pixel : 500(h) x 582 (v)

Horizontal Frequency : 15625 Hz.

Vertical Frequency : 50 Hz

Power supply : 230VAC/24 VAC

Synchronization : Internal

Scanning System : 2 : 1 interlace

Resolution : Horizontal not less than 520 TV lines

Sensitivity : not more than 0.01 lux

S/N Ratio : more than 48 db (AGC off)

Gain Control : (AGC) automatically

Electronic shutter : Auto : 1/50 sec To 1/80,000 sec

Ohms : 1 Vp-p Composite video output, Linear Output
75

Lens mount : C/C

Operating Temperature : - 5to 45 deg C

Technical Specifications for Monochrome Monitor

1. Input signal : CCIR
2. Picture tube : 12" diagonal 90 deg deflection

3.	Resolution	:	More than 700 lines at centre
5.	Video Bandwidth	:	100 Hz - 12 Mhz
6.	Power consumption	:	less than 30 W
7.	Power Supply	:	230V AC/50H

TS 17 : LIST OF APPROVED MAKES OF MATERIALS :-

Material & Description	Approved Makes
H.T. Switchgear	:Siemens, CromptonGreaves
Transformer	:Voltamp,Crompton Greaves
PVC conduits & Accessories to I.S.	:Precision / Circle Arc (conforming specifications)
Wiring Accessories	:MK, CRABTREE
Flush Mounting, Zinc coated M.S. Boxes	:MK, CRABTREE
PVC Armoured Cables - Copper	: CCI/Gloster/INCAB/ Finolex
PVC Armoured Cables - Aluminium	:CCI / Gloster / INCAB/ Finolex
Stranded Copper Conductor 650/1100 Volt grade	
PVC Insulated wires. (confirming to I.S. specifications)	:Sundeeep, Pagoda, Rajnigandha
Flexible Chord	:Rajnigandha, Pagoda
Copper Lugs	:Dowells
Brass Cable Glands	:Siemens Type SG Make
M.S. Conduits	:B.E.C. / Vimco
Material & Description	Approved Makes

M.S. Conduit Accessories	:PEI, PEW
Fluorescent Lighting Fixtures	:Philips,Crompton,Raymold
Spotlights & Decorative Lights	:As per B.O.Q.
Exhaust Fans Heavy Duty Type	:Crompton, GEC
D.G. Sets	:Refer Specifications
Street Light, Fixtures, Poles & Bollards	:Raymold - Chennai - Tel. No. 483 5791 Fax No. 483 7943
Music Speakers	:Gemini, Ahuja, Allwave Radio

Deck

:Philips

Amplifier	:Philips, Ahuja
Switchgear & accessories for LT Panels / DBs Specifications forL. T. Panels	:Refer Technical
D.G. Sets – Diesel Engine	: Caterpillar/Lister/ Petter
D.G. Sets – Alternator	: Kirloskar/Electric Stamford/NGEF/ Jyoti

TS 19 : SPECIFICATIONS FOR MCB DISTRIBUTION BOARDS

1. Scope :

The scope of this specification covers supply, installation, testing and commissioning of distribution boards with MCB's or HRC fuses for lighting.

2. Standards :

The following standards shall be applicable :

IS 4064 - 1978	: Heavy Duty Fuse Switch Units
IS 2675 - 1966	: Distribution Fuse Boards

IS 8828 - 1978

: Miniature Circuit Breakers.

IS 9224 - 1979

: High Rupturing Capacity Fuse Links Earth Leakage Circuit Breakers.

3. Construction :

- a) The DB's shall be constructed out of 1.6 mm thick sheet steel.
- b) The DB's shall be preferable wall mounting, indoor type with proper gaskets at door and joints to ensure dust and verminproof enclosures.
- c) The top and bottom of the DB's shall have removable gland plates for conduit entries. In case, the DB's are to have a an incoming feeder of switch fuse unit then this feeder shall be in a separate compartment, with proper barriers between incoming and outgoing feeders. For easy spread of cables adaptor boxes on DB's should be provided.
- d) The phase busbars shall be of 200 Amps minimum, preferable thinned copper. The neutral busbar shall be of tinned copper with adequate number of punching type screw terminals. Adequate space shall be provided at the top and bottom to facilitate easy terminations of incoming and outgoing cable.
- e) The earthing bar and terminals shall be provided.

4. Fuses :

- a) The fuses shall be of HRC cartridge fuse link type having a certified - rupturing capacity of not less than 46 kA at 415 Volts AC. The HRC fuses shall conform to IS 9224 - 1979. All fuses shall have a visible indication to indicate a 'blown' condition. The tags of the fuses shall be of the plug-in type of the bolting type.

5. HRC Fuse Carriers :

The HRC fuse carriers/bases shall be of high grade phenolic mouldings. The contacts shall be silver plated and the contact block shall be suitable to receive the rated conductors of aluminium.

6. Miniature Circuit Breakers :

The MCBs shall be of single pole, double pole, triple pole or four pole as required. The MCBs shall be of thermal magnetic type with a rupturing capacity of 9 kA at 415 V.

7. Industrial type Plugs and Sockets :

Industrial type plugs and sockets shall be constructed out of non-corroding die cast aluminium alloy. The contact tubes of the sockets shall have the facility of self-alignment and easily removable from the base for wiring. The plugs shall have robust contact pins, with a grid pin to ensure non-reversibility. The plugs shall have a rubber cable guard at the point of entry.

8. Tests :

- a) High Voltage Test at 2.5 kV.
- b) Power and Control Circuits continuity Test.
- c) Insulation Resistance Test with 1000 V meggar.
- d) Operational Test.

e) Three sets of test certificate to be submitted.

9. Drawing and Date :

Three sets of General Arrangement Drawings and Wiring Diagrams of all types of Feeders shall be submitted.

TS 20 : SPECIFICATION OF OUTDOOR SUB-STATION

22 KV OUTDOOR SUBSTATION

The 22 KV Outdoor Substation shall be generally constructed as per Drg. No.

The Contractor shall prepare a Substation Layout drawing based on our design and as per the requirements of the Electrical Inspector, Local Power Authorities and site conditions. Approval of the Substation Layout shall be obtained by the Contractor from the concerned authorities.

The Structural Rolled Steel Joists (RSJ) of 200 mm x 100 mm and the 100 mm x 50 mm x 60 mm thick channels used in the construction of the 4 pole Structures shall be of straight lengths and shall be cleaned to remove rust before painting with 2 coats of Silver Paint.

The Concreting work shall be carried out with good quality materials and to the satisfaction of the Architect's representative at site.

H.T. Switchgear and Insulators shall be of approved make. Test Certificates from the Manufacturers shall be submitted for all equipments supplied by Contractor.

The Transformer Oil (supplied along with the Transformer) shall be tested and oil filtration shall be carried out if required.

1.0 Structures

For structures stability proper Angle Iron bracing shall be provided. For supporting gang operating 22 KV Airbreak switches dropout fuses, post insulators, lightning arrestors and bus bars. Provide proper M.S. Channel or M.S. Angles as required.

2.0 Cross Arms

Cross arms shall be of M.S. Channel Iron of size not less than 10 cm. x 5 cm. x 6 mm (4" x 2" x 1/4").

3.0 22 KV Pipe Type Insulators

These Insulators shall meet the following standards of Indian Standards Installation and bear the certification marks of ISI as regards their quality and soundness Period for their full value provided under this Contract from any cause whatsoever above.

IS 2544 - as amended upto-date. Porcelain post Insulator 3.3 KV and above.

4.0 H.T. Insulator Fittings

These shall comply with the tests and specifications as laid down in IS 248-1963 (Part I and II) specification for the Insulator fittings for overhead power lines of 3.3 KV and above. General requirements tests and dimensional requirements.

5.0 22 KV Lightning Arrestors

22 KV lightning Arrestors shall be of single cors, Thyrite, magna valve distribution class (500 amps. Discharge current rating) lightning Arrestors rated at 27 KV suitable for altitudes upto 12000 ft. These shall be supplied complete with mounting brackets and should be suitable for use on 22 KV neutral grounded systems as required or any other equipment types approved by EIC.

6.0 22 KV Gang operated A B Switches and dropout fuses.

Gang operated A B Switches shall be suitable for 22 KV 400 amps and shall be of 3 phase 50 cycles, pole mounted type, 3 insulator per phase. Triple pole rocking, outdoor types, gang operated, Airbreak switches, suitable for both horizontal or vertical mountings complete with the following components :

- i) 22 KV post insulators.
- ii) Channel bases for mounting post insulators.
- iii) Operating mechanism complete with 20 feet long operating pipes, phase coupling Shaft, operating handle with padlock arrangements.
- iv) M.S. Arcing horns.
- v) Proper connecting arrangements for accommodating incoming and outgoing aluminium conductor wires.
- vi) Non-ferrous parts shall be electroplated and ferrous parts shall be not dip galvanised.

The A B Switches should be capable to withstand 100 MVA at 22 KV.

7.0 Fuse Mounting

All current carrying parts shall be aluminium bronze gravity die casting with the exception of the brush contacts which should be made of extra hard phosphore bronze and the H.D. High Conductivity copper top bracket. The insulators shall be brown, glazed porcelain. Connections to the fuse mount shall be made at top and bottom by spring washers.

8.0 Fuse Carrier

Fuse Carrier shall consist of bakelite/Fibre tube of special quality, suitable for outdoor use and lined with grey fibre. Each and shall have a ferule. The bottom of ferrule shall be fitted with a pivot pin. Which swings in the hook casting of the fuse mount.

A flat surface on the ferrule shall make a contact with the brush contact on the mounting. The top ferrule carries the collapsible latch on which is another flat surfaces for making contact with the top brush contact. The ferrules and latch shall be aluminium gravity die casting.

9.0 Fuse Element

This shall be made up of a round flexible braid between which is brazed a fusing wire or wires which in turn is covered with a short acrylic resing tube. Proper capacity fuse element shall be provided to suit the transformer capacity.

10.0 Outdoor Airbreak Switch

- i) All the ferrous parts shall be of anticorrosive finish and not dip galvanised.
- ii) The moving insulator connection shall be done through flexible copper strips.
- iii) Flexible copper connections between the rotating shaft and the frame shall have a cross section of atleast 50 sq.mm.
- iv) A B Switches and Dropout fuses shall withstand the rated mechanical terminal loaded and electromagnetic forces without impairing their operational reliabilities or current carrying properties.
- v) A B Switches and dropout fuses inclusive of their operating mechanism, shall be such that they cannot come out of their open or closed positions by gravity, wind pressure and vibrations.
- vi) A B Switches and dropout fuses shall be capable of resisting in closed position the dynamic and thermic effects of the maximum possible short circuit current.
- vii) The A B Switch shall strictly confirm to IS 1818 as amended upto date.

11.0 Earthing

Earthing of structure, and other components shall be carried out as per rules and regulations. Provide separate earthing for lightning arrestors. For detailed earthing specifications described under earthing.

12.0 Painting

All steel work shall undergo a process of degreasing pickling in Acid, Cold Rinsing, phosphating, preservative, then sprayed with a high corrosion resistant red oxidized primer.

The finishing treatment shall be by application of Aluminium paint.

1.2 TS 21 : SPECIFICATIONS FOR TRANSFORMERS

TRANSFORMERS

1.0 SCOPE :

Scope of these specifications covers the manufacturing, testing, supply, installation and commissioning of transformers.

2.0 GENERAL REQUIREMENTS :

2.1 System of Supply :

System of supply will be 11 KV, 3 Phase, 50 Cycles, Solidity earthed system.

2.2 Rating :

Transformers shall be 2000 KVA rated as per the design consideration and as per IS11171.

2.3 No load Voltage :

No load Voltage shall be 11000 Volts on H.V. Side and 433 Volts on M.V. Side.

2.4 Ratio :

Ratio shall be 11000/433 Volts

2.5 Connections :

Connections shall be Delta on H.V. side and Star on M.V. side with Neutral Terminal brought out for solid earthing.

2.6 Vector Groups :

Vector Groups shall correspond to the Vector symbol Dyn-11.

2.7 Impedance :

The transformers shall be so designed and manufactured to have matched impedance for a parallel operation.

Impedance shall be 5% and variation in impedance of the finished product shall be within + / - 5% of the nominal impedance value.

2.8 Type :

Transformer shall be suitable for indoor installation, acceptable to B.S.E.S. and State Electrical Inspectorate.

3.0 MATERIALS AND CONSTRUCTION :

Transformers shall be totally concealed of IP-20 protection class step down transformer from 11 KV to 433 Volts, copper wound and of approved make. It shall be double wound cast resin dry indoor type with Delta connections on HT side and Star on LT side. The arrangement of the winding shall be such that there will be electrical and magnetic balance under all conditions of operation. The design, treatment and construction of the transformers and bracings of the winding shall be such as to withstand the heavy mechanical and thermal stresses which may be experienced under conditions of daily cycles of heating and cooling due to fluctuation in loads and of dead short circuits on either side of the transformer. The inter- turns and end-turns of the HV and LV windings shall be insulated for protection against surges and transients.

Insulations shall be of class 'F' or higher conforming to IS 1271- 1958 (latest amendment).

Transformers shall have tap changing device on high tension side for tapping from minus 10% to plus 5% at steps of 2.5% (seven tappings). In order to view the tapping position, an inspection window with glass and neoplane gasket shall be provided on the transformer enclosure. The winding insulation shall be suitable for earthed 11 KV system. The rated frequency shall be 50 HZ and the transformer shall be designed with the frequency variation by 3% above or below 50 HZ. Transformers shall supply a pre-dominantly commercial load with an average load factor of 60% or a lagging power factor between 0.85 and 0.95. The desired impedance shall be 5% at normal tap and 75 degree C temperature.

Transformers shall be complete with the following accessories :

- a) Externally hand operated off circuit tap changing links.
- b) Winding temperature indicators complete with thermister and annunciator (alarm and trip).
- c) Diagram rating plate, terminal marking plate.
- d) Two earthing terminals with lugs at the centre of the bottom channels supporting the transformer.
- e) Lifting arrangement.
- f) Four bi-directional rollers.
- g) Vector Group Dyn II.
- h) HV Cable Box.
- i) LV Cable Box with flange for bus duct.
- j) Control Box for indications.

Transformers shall be suitable for tropical climate with ambient temperature of 50 degrees C and 100 % air humidity.

Transformers shall have core type construction built up with high grade alloy, lowloss ChC4 silicon steel laminations with resistant double insulation. Transformers shall be capable of withstanding thermal and mechanical effects of short circuit on the terminals of any winding with full voltage maintained on other windings as per IS : 2026/1977. Appropriate danger boards shall be fixed around the transformers in order that nobody touches the bare parts of HV and LV windings. All iron parts of the transformers except the core shall be not galvanised. The core shall be protected against corrosion by a resin coat.

Transformers shall conform to the ISS 11171/1985 and 2026/1977 subject to latest corrections and modifications. HT Cable Box shall be suitable for XLPE 3 core 240 sqmm cable and the entry of cable shall be from ground trench through the bottom of enclosure. LT Cable Box shall be suitable for bus duct through the side top of the enclosure. Flange details should match for mounting of the bus duct. Separate neutral bushing shall be provided at least at two points on each. Enclosure shall also be solidly grounded. TS 22/3

DRAWINGS :

Contractor shall submit G.A. Drawing and details of foundations of the transformers.

INSTALLATION :

Installation, Testing and Commissioning shall conform to IS Code of Practice IS : 1886-1967 and Regulations of Local Authorities. Transformers and all its accessories shall be handed carefully in its upright position as indicated on the packing case. When lifting a transformer, care shall be taken to see that lifting chain will not interfere with any part of the transformer. Never fix the sling to any other part of the transformer, except the lifting lugs. Lifting lugs and jacking pads shall be used for lifting of the transformer. While using jacking pads utmost care shall be taken in proper application of jacks. When transformer is dragged or pulled on sleeper or rollers, the traction eyes provided at the bottom frame shall be used with suitable wire ropes and shackles.

Transformers shall be mounted on MS Channels embedded in cement concrete. The rollers shall be chocked to prevent movement of the transformer after being positioned on the plinth. Adequate and necessary clearances from walls etc. shall be provided as required as per IS : 1886-1967.

There shall be two separate signal systems for warning and tripping with regard to winding temperature of the coils. Thermister sensors measure the temperature of the low voltage winding inside the cast coils. Alarm contact shall be designed to operate at 145 degrees and trip contact at 165 degrees C. The temperature protection equipment shall be suitable at 24V D.C. supply. The temperature rise of winding shall not exceed by 90 degrees C by resistance on continuous full load above maximum ambient temperature of 50 degrees.

Since the transformer coils will be located about the core and centered only by the supporting blocks, it must be, therefore, handled very carefully during transportation, loading and unloading. Transformers shall be loaded on the transport vehicle with longer axis of the core/coil assembly in the direction of transport so that the danger of the transformer assembly toppling / setting shocks due to sudden starting or breaking of the transport vehicle will be minimised.

TESTING :

Transformers shall be subjected to the following routine tests at the manufacturer's work before dispatch.

- a) Measurement of winding resistance.
- b) Voltage ratio, polarity and phase relationship.
- c) Measurement of impedance voltage.
- d) Load losses.
- e) No load losses and no load current.
- f) Induced over voltage withstand.
- g) Separate source voltage withstand.
- h) Partial discharge 25 % upto 1.2 times the rated voltage.

The power frequency test voltage for the secondary winding shall be 2.5 KV R.M.S. Transformers shall be charged only after the tests are conducted and approval of local authorities is obtained.

1.2.1.1.1.1.1.1.1 TS 22 : SPECIFICATIONS FOR BATTERY AND BATTERY

CHARGER

1.0 SCOPE :

This specification provides for design, manufacture, testing and transportation of Nickle Cadmium type maintenance free BATTERIES AND BATTERY CHARGER for M/S ASB International Private Limited, MIDC Ambernath, Maharashtra.

2.0 SITE CONDITIONS :

1.2.1.1.2 Ambient Temperature : 45 Deg. Maximum

Altitude : Less than 100M above MSL

Humidity : 80% (Maximum)

3.0 CODES AND STANDARDS :

The design, manufacture and performance of battery and charger shall conform to the following Indian Standards :

IS : 4237	:	General Requirements for switchgear and controlgear
IS : 8623	:	Factory built assemblies of switchgear and controlgear (upto 1000 volts)
IS : 13947	:	Specification for low voltage switchgear and controlgear
IS : 6619	:	Safety code for semi-conductor rectifier equipment
IS : 694	:	PVC insulated cable
IS : 4540	:	Monocrystalline semi conductor rectifier assemblies and equipment
IS : 3895	:	Monocrystalline semi conductor rectifier cells and Stacks
IS : 1248	:	Electrical Indicating Instruments
IS : 2705	:	Current Transformer
IS : 3156	:	Voltage Trasformer
IS : 6875	:	Control switches and push button stations Indian Electricity Rules

4.0 GENERAL REQUIREMENTS :

4.1 BATTERY :

4.1.1 Battery shall be of 24V, 105 Ampere Hour capacity. Battery shall be of Nickle Cadium maintenance free type. Nominal cell voltage shall be of 1.2 volts discharged to end voltage of 1.14 Volt / cell.

4.1.2 The battery shall be suitable for indoor installation.

4.1.3 Batteries shall be located in a separate cabinet adjacent to battery charger.

4.1.4 Vendor shall include, in his offer, all the accessories, tools, tackles required for commissioning and maintenance of batteries.

4.2 BATTERY CHARGER :

4.2.1 Battery charger panel shall be indoor, cubicle type, floor mounted, dust and vermin proof, front attended type.

4.2.2 Control panel for battery charger shall comprise of rigid structural frame enclosed by 2mm thick cold rolled sheet steel. Doors and covers shall be from 1.6mm thick cold rolled sheet steel. Structural framework with foundation bolts etc. shall be provided at the bottom to mount battery charger panel directly on concrete floor/steel channel base on wall with suitable frame-work.

4.2.3 All doors/removable covers shall be gasketed all round, preferably with neoprene gaskets.

4.2.4

- 4.2.5 The enclosure shall be liberally designed to ensure adequate heat dissipation in an enclosed non-ventilated premises. Temperature rise of plant shall not be more than 10 Deg. C above ambient temperature.
- 4.2.6 Minimum space between Gland Plate and Terminal Block shall be 150mm. Adequate space shall be provided for termination of incoming (A.C.) and outgoing (D.C.) Power Cables.
- 4.2.7
- 4.2.8 Cooling fans shall be provided at the top, if necessary. If cooling fans are provided, then starter shall be provided inside the panel.
- 4.2.9 All metal work, including sheet steel, shall be given a pre-treatment of rust removal, degreasing, phosphatising, pickling etc. After completion of pre-treatment, it shall be given 2 coats of Acid and Alkali resistant primer, preferably stoved, and finished with 2 coats of Acid-Alkali resistant paint.
- 4.2.10 All external components shall be provided with anodized aluminium name-plates, with white letters on black background. Internal components shall be provided with PVC labels.
- 4.2.11 Cubicle illumination with door switch and an additional manual switch shall be provided.
- 4.2.10 Anti-condensation space heater with switch, thermostat shall be provided inside the cubicle.

4.2.12 **PERFORMANCE :**

- a) The automatic constant voltage regulator shall regulate the DC voltage within $\pm 1\%$ of the set value from no load to full load, under the supply voltage and frequency fluctuations of 7.5% and $\pm 5\%$ respectively.
- b) Charger shall have built-in-current limiting feature to drop the output voltage on currents more than 110% of the rated current.
- c) Suitable ripple filtering circuits shall be provided to give a smooth D.C. output. The ripple content shall be limited to less than $\pm 2\%$ on resistive load.

5.0 **TESTS :**

- 5.1 Routine tests (Acceptance Tests) such as visual inspection, dimensional check etc. shall be conducted as per relevant I.S.
- 5.2 Type Test Certificates for retention of charge, Capacity Test, Ampere-hour efficiency, Watt-hour efficiency etc. shall be submitted for approval type tests shall be carried out in the presence of Owner/Representative.
- 5.3 Six copies of the Routine and Type Test Certificates shall be submitted for purchaser's records.

6.0 **INSPECTION :**

- 6.1 Inspection including witnessing Tests will be carried out by Purchaser or his authorized representatives.
- 6.2 Vendor shall intimate, in writing, the date of inspection to Purchaser, at least seven (7) days before the scheduled date of inspection.

7.0 **GUARANTEE :**

- 7.1 Vendor shall guarantee all material for a period of twenty four (24) months from the date of commissioning or thirty (30) months from date of dispatch whichever is earlier. During this

period, if any defect is noticed due to bad workmanship/material etc., vendor shall replace or repair the same, free of cost.

8.0 DRAWINGS :

8.1 Vendor shall submit G.A. Drawing and categories of Battery and Charger alongwith his quotation.

8.2 Vendor shall submit four (4) sets of the following drawings within seven (7) days for approval, after award of contract.

i. Outline dimensions and general arrangement with section, foundation details for battery charger panel.

ii. Constructional details of cell.

iii. Wiring diagram for battery and battery charger panel and various battery characteristic curves.

8.3 One print of each drawing will be returned to vendor after making all necessary corrections, changes and required clarifications. Vendor shall incorporate these and send, within seven (7) days, six prints of each drawing marked "Certified for Record and Use".

8.4 Vendor shall submit six copies of installation and instructions manual.

9.0 Enclosed data sheet indicates detailed quantity and technical requirement.

9.1 Makes of Components/Equipment

- | | | | |
|-----|---|---|-----------------------|
| 1. | Indicating instruments | : | AE/IMP |
| 2. | Switches | : | Kaycee |
| 3. | Push Buttons | : | Teknic |
| 4. | HRC Fuses | : | Siemens / L&T / EE |
| 5. | Indicating Lamps | : | L&T / Cands / Siemens |
| 6. | Terminals | : | Elmex / Connectwell |
| 7. | Selector Switches | : | Kaycee |
| 8. | Control Wire | : | Finolex / Polyplast |
| 9. | MCBs | : | MDS / S&S / Siemens |
| 10. | Nickle Cadmium Maintenance free Batteries | : | SABNIFE |
| 11. | Instrument Transformer | : | Precise / Ind Coil |

10.0 SPECIFIC REQUIREMENTS :

1.2.1.1.2.1.1.1.1.1 ITEM QTY DESCRIPTION

A.1 1 NO. **BATTERY** :

Nickel Cadmium maintenance free battery having Ampere-hour capacity 105 Ampere-hour. Nominal cell voltage of 1.2V, (total 20 cells) discharged to an end voltage of 1.4V/Cell, mounted in a cabinet assembled and connected in series, to give nominal 24 volt DC voltage.

The container shall be of Tough Polypropylene a Polystyrene.

Battery shall be complete with inter-cell, inter-row, inter-tier, inter-bank connectors. All necessary accessories, hardware etc. shall be supplied for satisfactory operation, commissioning and maintenance of the battery.

B BATTERY CHARGER CONTROL PANEL :

Sheet steel enclosed, dust, damp & vermin proof, suitable for front board operation and floor mounting. It shall be capable of charging 24 Volts, lead Acid Battery having capable of charging 24 volts, Lead Acid Battery having capacity of 105 Ampere-hour.

- B.1 Potential indicating lamps along with ballast resistor & Diode, operated on 240 Volt A.C.
- B.2 HRC Fuse fittings and HRC Fuse links (for incoming supply).
- B.3 Flush mounting , single phase / three phase
 - i. $\pm 15\%$ voltage variation
 - ii. To provide for trickle and boost charging in stepless manner
- B.4 HRC control fuse fittings 16A and HRC fuse links rated for 6A (RYB&N)
- B.5 144sqmm 0-500V, voltmeter with selector switch
- B.6 2 – winding transformer, low reactance type with underground secondary for trickle and boost charger. It shall be suitable for continuous 15% over-voltage. Taps shall provide on primary side to control charger output voltage with off-load tap.
- B.7 Rectifier Diodes, shall be provided with adequate heat sinks, surge suppressers and fast acting fuses.
- B.8 Necessary L-C filter with suppression shall be provided in the output to minimize the ripple content to about 2%.
- B.9 Automatic voltage regulator unit (for float charger) with Auto/Manual selector switch
- B.10 HRC fuse bases with HRC fuse links for protection of DC output circuit.
- B.11 Single pole, 2 position – lockable, quick make, quick break heavy duty switch (Trickle/Boost).
- B.12 Heavy duty, QMQB, front board operation switch for AC incoming side, and two nos. switches for Trickle/boost.
- B.13 Double pole, QMQB, heavy duty switch (24V, DC22 duty) for connecting/disconnecting battery charger and load.
- B.14 All required AC/DC ammeters for measurement of charger current, load current, battery load current indication etc. shall be provided.

- B.15 Similarly all required AC/DC ammeters for measurement of charger current, load current, battery load current indication etc. shall be provided.
- B.16 All protective relays such as under-voltage, earth-fault, over voltage relay etc. shall be provided for satisfactory operation of charger.
- B.17 Terminal block for PVC armoured cable.
- B.18 Rotary switch (10A) and fuse link (6A) for controlling single phase 240V, 100W cubicle space heater.

C. 1 SET **INCOMING AND OUTGOING FEEDERS FOR DC DISTRIBUTION SHALL BE PROVIDED ON CHARGER ITSELF.**

Details of feeders shall be as follows.

C.1 **INCOMING FEEDER :**

- C.1.1 1 NO. 2 Pole, QMQB, heavy duty 63A switch.
- C.1.2 Indicating lamps.
- C.1.3 HRC fuses with HRC fuse links.
- C.1.4 DC voltmeter for DC potential measurement.

C.2 **OUTGOING FEEDERS :**

- C.2.1 3 NOS. 2 Pole QMQB, heavy duty 32A switches.
- C.2.2 HRC fuse base with HRC fuse links.

C.3 1 SET Terminal block suitable for PVC armoured cables.

- Note :**
1. Battery charger shall be capable of fully recharging the battery within 8 hours from the discharged state of 1.14/cell.
 2. Charger shall be capable of supplying an external DC Load of 30A in addition to the requirement of charging the batteries.

DATA BY BIDDER

BATTERY

Manufacturer's Name : Sabnife Power System Ltd.

Standard to which battery

is manufactured : *

Capacity at 25 Deg. C : *

Initial AH : *

Rated	AH	:	*
End of Life	AH	:	*
Rated capacity at minimum & Maximum ambient temperature			
AH		:	*
Capacity at high discharge at 27 Deg. C			
15 Minutes	A	:	*
30 Minutes	A	:	*
40 Minutes	A	:	*
45 Minutes	A	:	*
1 Hour	A	:	*
2 Hours	A	:	*
3 Hours	A	:	*
4 Hours	A	:	*
5 Hours	A	:	*
6 Hours	A	:	*
7 Hours	A	:	*
8 Hours	A	:	*
9 Hours	A	:	*
Maximum momentary current:			*
(1 minute)	A		
Expected life of battery		:	*
Total resistance of battery		:	*
Resistance of intercell			
Connectors ohm		:	*
Charging rate			
Float charging Voltage V		:	28V

	Current A:	*	
Trickle charging	Voltage V:	*	
	Current A:	*	
Boost charging	Voltage V	:	34V
	Current A	:	*
Expected fault level at bus due to			
Batter	A	:	*
AH efficiency at rated load	%	:	*
Watt hour efficiency at rated			
Load	%	:	*
Type of positive plate		:	*
No. of positive plates / cell		:	*
No. of cells required to give rated			
D.C. Voltage		:	20
No. of spare cells, if any		:	*
Type of container-Polypropylene/			
Polystyrene		:	Polypropylene
Type of cell		:	Nickel Cadmium
Overall dimensions of each cell			
In mm		:	74 (L) X 134(W) x 374(H)
Overall dimensions of complete			
Battery in mm		:	760 (L) X 300(W) x 630(H)

DATA BY BIDDER

BATTERY CHARGER

- | | | |
|---|---|---|
| a) Voltage regulation | : | $\pm 1V$ for +10% input
Voltage variations, 5 – 100% load variations |
| b) Whether AVR is provided for
Float charger | : | * |
| c) Type of AVR | : | * |
| d) Guaranteed efficiency% | : | 65% |

- e) Power factor : *
 - f) Maximum permissible
Temperature rise over ambient
- Deg. C : *
 - g) Class of insulation for
Transformer and rectifier : *
 - h) Type of rectifier cell : *
 - i) Method of cooling :
 - For Transformer : *
 - For rectifier cells : *
 - j) Whether smothering circuit
offered with battery : *
 - k) Details of diodes : *
 - l) Overall dimensions of charger
in mm : 1250 (H) X 750(W) x 600(D)
 - m) Weight of charger : *
 - n) Wiring / Schematic diagram of
charger : *
- * Vendor to furnish the details

ANNEXURE - A

SCOPE OF SUPPLY

SUPPLY OF BATTERY INCLUDES THE FOLLOWING ACCESSORIES

Sr.	Description	Qty.
No.		
1.	Battery stand for accommodating the cells in single row, double tier	1 No.
2.	Inter-connections as required	1 Set
3.	Cell number plates with fixing pins (1 Set)	20 Nos.
4.	Cell testing voltmeter (3-0-3) complete with leads	1 No.
5.	Spanner	1 No.
6.	Rubber Gloves	2 Nos.
7.	Eye-wash kit	1 No.
8.	Safety & First Aid kit	1 Set

TS 23 : COMPACT SUBSTATION :

A. PACKAGE SUBSTATION

1. INTRODUCTION

Designed to equip public distribution networks for 12KV, **compact substation** (outdoor non walk-in type) is to supply LV networks. It essentially includes:

- The enclosure of the compact substation,
- The MV switchboard of **MV SF6 CB**
- The transformer
- The **LV ACB**,
- operating accessories.

Compact substation is designed for :

- fast installation,
- maintenance free,
- safety for workers and public,

2. STANDARDS FOR COMPLETE COMPACT SUBSTATION

The equipment proposed should be designed, manufactured and tested in compliance with

- | | | |
|--|---|----------|
| ◆ Common clause for high voltage switchgear and low voltage switchgear | IEC 694 | |
| ◆ 'A.C. metal-enclosed switchgear and control gear' for rated above 1KV and up to and including 52 KV. | IEC 62 271-200 | voltages |
| ◆ AC switches and earthing switches | IEC 129 | |
| ◆ Switches and disconnectors | IEC 265 | |
| ◆ ircuit breakers | IEC 62 271-100 | |
| ◆ Combined switch/disconnectors | IEC 420 | |
| ◆ High voltage fuses | IEC 420 | |
| ◆ High voltage test procedures | IEC 60 | |
| ◆ Distribution substation up to 52 kV | IEC 1330
(1 st ed. Nov. 95) | |
| ◆ Classification of degrees of protection for enclosures | IEC 529 | |
| ◆ Transformer | IEC 76 | |
| ◆ LV switchboard | IEC 439-1 | |

3. GENERAL CHARACTERISTICS in accordance with the IEC standards

Description		
Rated voltage	kV rms	11
Operating voltage	kV rms	12
MV Insulation level:		
Rated withstand voltage at power frequency: 50Hz/1 min	kV rms	28
Rated impulse withstand voltage: 1.2/50µs	kV peak	75
MV Network and busbar		
Rated current	A	630
Rated short-time current	kA rms/ 3s	20
Making capacity for switch-disconnectors and earthing switches	KA peak	50
LV Network		
Rated voltage	V	433

In accordance with IEC recommendations, these characteristics are valid for :

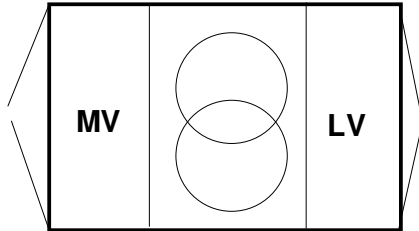
- ◆ Altitude : Less than 1000 meters above sea level
- ◆ Temperature :from - 5 °C to + 55°C
- ◆ Operation in very hot climates + 50°C

(i)

3. DESCRIPTION OF THE OUTDOOR ENCLOSURE

- ◆ The enclosure is made of Sheet Steel tropicalised to Indian Weather Conditions.
- ◆ The colour is : RAL 7032
- ◆ The metal base is made of 4mm hot dip galvanised steel and ensures rigidity for easy transport and installation.
- ◆ The structure of the substation is capable of supporting the gross weight of all equipment.
- ◆ Intermediate ceiling roof is provided. A minimum clearance is left between the top of any component installed in the substation and the roof of the substation.
- ◆ Protection degree of the enclosure for transformer compartment shall be minimum IP 34 and for MV & LV compartment shall be IP54.
- ◆ Ventilation apertures are sufficient for natural ventilation (Class K10)
- ◆ MV and LV compartments are accessible on the sides of the substation through double doors equipped with key lock, and rubber seals. The doors can be padlocked and/or lock protected (padlocks not supplied).
- ◆ The outgoing of the distribution transformer is to be connected directly to the incomer of the LV distribution through bus bars. Termination kits & boots for compact MV circuit breaker are in supplier scope.

- ◆ Earth bus shall be made of 25x3 sq. mm Cu/ Eqvt. GI for devices connected to metal enclosure. System earth 40x8 sq. mm. Cu / Eqvt. GI connected to metal enclosure
- ◆ 1 No. heater with thermostat 100 Watt with thermostat in LV compartment.
- ◆ 3 Nos. 4A MCB for lighting & illumination circuit.
- ◆ 3 compartments separate the different components (RMU / Transformer / LV) for safe operations.



1.2.1.1.2.1.2 DIMENSIONS

Overall maximal dimensions don't exceed:

Substation	
length (mm)	3000
width (mm)	2500
height (mm)	2200

Dimensions of transformer compartment allow installation of transformer with following maximum dimensions.

4. COMPACT RMU with SF6 circuit breaker

Compact RMU switchgear with SF6 circuit breaker for transformer: with internal arc fault tested design for SF6 gas container and cable compartment for 20kA for 1S.

The RMU shall be "totally SF6" insulated switchgear with built-in functions and compact dimensions not exceeding 500 x 775 x 1760mm (w x d x h).

This self-contained metal-enclosed unit constitutes the MV component of the MV/LV transformer substation or the branching point of an MV network. The RMU regroups, in a single **stainless steel** enclosure, all the medium voltage functions enabling transformers to be connected, supplied and protected.

1.3 4.1. STANDARDS

The equipment proposed in this offer shall be designed, manufactured and tested in compliance with IEC recommendations.

IEC Publication	Title

IEC-Publ. 62 2271-200	'A.C. metal-enclosed switchgear and control gear' for rated voltages above 1 kV and up to and including 52 kV
IEC Publ. 60 694	Common specifications for high voltage switchgear and control-gear standards
IEC-Publ. 60 129	Alternating current disconnectors and earthing switches
IEC-Publ. 60 265-1	High-voltage switches for rated voltages above 1 kV and less than 52 kV
IEC Publ. 60 282	High-voltage fuses – Current-limiting fuses
IEC Publ. 62 271-100	Circuit breaker
IEC-Publ. 60 420	'High voltage alternating current switch-fuse combinations
IEC Publ. 61 243-5	Voltage detecting systems
IEC Publ. 60 071	Insulation co-ordination

1.4 4.2. **Electrical characteristics**

Description		
Rated voltage	kV rms	11kV
Operating voltage	kV rms	12kV
Insulation level:		
Rated withstand voltage at power frequency: 50Hz/1 min	kV rms	28kV
Rated impulse withstand voltage: 1.2/50µs	kV peak	75kV
NETWORK AND BUSBARS		
Rated current	A	630A
Rated short-time current	kA 3sec	20KA
Making capacity for switch-disconnectors and earthing switches	KA peak	50kAp
Internal arc withstand for SF6 container and cable compartment	KA	20kA for 1sec
TRANSFORMER SF6 CIRCUIT BREAKER		
Rated current	A	630A

General description for RMU SF6 Circuit breaker:

The switchgear shall be tested as per the latest **IEC 62271-200/100 for internal arc fault for HV container and cable compartment for 20kA for 1 sec.**

The switchgear shall be maintenance free and independent from environment.

The high voltage part shall be in enclosure filled with SF6, hermitically sealed without the use of sealant/gaskets/O-rings to ensure no leakage of **SF6** for life time. The SF6 gas filled switchgear container shall be made up of 2.5 mm stainless steel, laser robotically welding and hermitically sealed without the use of any gasket/sealant/O-ring for life time. The cable termination bushings shall also be welded to the **HV** stainless steel container to avoid any **SF6** gas leakage

The transformer feeder shall be SF6 circuit breaker tested as per **IEC 62 271-100** and designed as a three position switch so that the positions **ON-OFF-EARTH** can be achieved in one single breaker. Separate isolator for earthing of the breaker shall not be acceptable.

The cable connection shall be from front for easy access and installation without works with SF₆ gas at site. Side and rear cable access shall not be acceptable. The cable compartment shall be interlocked with the **CB** earthing switch, such that the cable compartment cover can be open only when the **CB** earth switch is **ON**. **The cable compartment has to be tested for internal are fault of 20kA for 1 Sec.**

No indirect cable testing facility shall be provided. The cable shall be tested directly on the cable bushings once the cable compartment cover is open after earthing the **CB**.

The **SF6 CB** shall be equipped with a temperature compensated "ready for service indicator". It is easy to interpret, e.g.: green = ready to operate and red = not ready to operate due to low SF₆ gas pressure. The indicator shall be independent from temperature, ambient pressure variation. **The gas pressure indicator**

shall be provided with the auxiliary switch for gas pressure low alarm. All bushings and drive links into the SF₆ gas filled container shall be gas tight welded to the container **without use of sealant/gaskets/O-rings**. The gas system shall be hermetically sealed. Following this a refilling of SF₆ gas during life time shall be excluded.

The switchgear shall be designed for T-plug connection with bushing acc. to EN 50181 interface type C with M16 thread (former **DIN 47636**) at the ring cable/transformer feeders. The bushings shall also be welded to the HV stainless steel container to avoid any **SF₆** gas leakage

5. MV / Transformer:

Connection between RMU & transformer will be done with 11KV XLPE cable as per transformer rating.

7. CAST RESIN DISTRIBUTION TRANSFORMER

1.0 SCOPE

- 1.1 This specification covers the requirements of design, manufacture, test and supply of indoor 11/0.433 KV Dry type Distribution transformers with a Delta/Star configuration complete with all accessories for efficient and trouble-free operation.
- 1.2 The equipment shall be of type-tested design as per standards for the ratings required as per BOQ. If the type test reports are not available for the required ratings, the test has to be conducted and relevant documents shall be submitted.
- 1.3 The transformer shall be housed indoor/Outdoor.

2.0 CODES & STANDARDS

The equipment covered by this specification shall, unless Other wise stated to be designed, constructed and tested in accordance with latest revisions of relevant Indian standards / IEC publications.

- IS 1271 - Classification of Insulating Materials.
- IS 2026 - Power transformers (part I - V)
- IS 2099 - Bushing for alternating voltages above 1000 V
- IS 2705 - Current transformers
- IS 3202 - Code of practice for climate proofing
- IS 3639 - Power transformer fittings and accessories
- IS/IEC - Moulded epoxy bushings for transformers
- IS 11171; IEC 60726 ; BS 171 - Dry type Transformer
- IS 8478 - Application guide for tap-changers
- IS 10028 - Code of practice for selection, installation and maintenance of transformers.

3 GENERAL DESIGN FEATURES

- 3.1 All Transformers shall be of latest design, Dry Type Cast Resin with a Delta/Star configuration.

- 3.2 The type of cooling shall be Natural Air Cooled (AN) and the corresponding Ratings for each Transformer shall be as indicated in the Specific Requirements.
- 3.3 Each Transformer shall be suitable for operation at Full rated power on all tapings without exceeding the applicable temperature rise.
- 3.4 The Transformer shall be capable of Continuous Operation at full load rating under the following conditions.
- a) Voltage Variation = $\pm 10\%$
 - b) Frequency Variation = $\pm 3\%$.
- 3.5 The transformer shall be dry type, AN cooled suitable for indoor installations. The core clamping frame shall be provided with lifting eyes having ample strength to lift the complete core and winding assembly.
- 3.6 The core assembly of Dry type transformers enclosure shall be electrically connected to the transformer tank for effective core earthing. Also copper flexible for earth continuity purpose shall connect different parts of transformers.
- 3.7 Transformer with all accessories shall be of free standing type. Transformer/accessories shall be designed in such a way that no supporting/post structure shall be required other than rail.
- 3.8 Off circuit tapings shall be provided on the HV windings. Tap changing is done by means of off-circuit links accessible through openings provided on the enclosure.
- 3.9 The lifting lugs and rollers shall be provided. A winding temp. Scanner shall be provided and is actuated by means of resistance temperature detectors embedded in LV windings of all three phases. It should have alarm and trip contacts at a specified temperature. The scanner shall be suitable for IP-52 protection.
- 3.10 Double leaf accessed door shall be provided on both side with concealed hinge and neoprene gaskets for easy access to HV links and also for with drawl of core and coil assembly, if required.
- 3.11 The transformers shall be designed to be capable of with-standing, without injury, the thermal and mechanical effects of short-circuits between phases or between phase and earth at the terminals of any winding with full voltage applied across the other winding for periods given in relevant standards. There shall be no limitations imposed by any part/component of the transformer/off load tap changer to meet the short circuit level Specified. The successful bidder shall justify their design with necessary supporting calculation. The maximum short circuit current shall be determined by computing the through fault current using the formula:
Short circuit current = (Rated Current x 100)/% Impedance.
- 3.13 The Transformer shall be designed to suppress harmonic content, especially the third and fifth, so as to eliminate distortion in the waveform and consequent additional insulation stress, noise on communication system and undesirable circulating currents between the neutrals at different transformer stations. Each transformer shall be designed for minimum no-load and load losses within the economic limit.
- 3.14 All outdoor apparatus/fittings shall be designed such that they do not collect water at any point.
- 3.15 All electrical connections and contacts shall be of ample cross sections for carrying the rated current without excessive heating.

4.0 CONSTRUCTION

- 4.1 The transformer shall be dry type, **AN** cooled suitable for Indoor installations. Transformer shall be suitably reinforced to prevent distortion during handling. Base channels shall be provided with skids and pulling eyes to facilitate handling.

4.9.7 This is a Cast Resin Dry Type Transformer so that Standard Manufacturing Procedure as per IES/IS/International Standard shall be followed.

4.10 OFF-CIRCUIT TAP CHANGING GEAR

4.10.1 Each transformer shall be suitable for operation at full rated power on all tapping without exceeding the applicable temperature rise.

4.10.2 Off circuit tapings are provided on HV windings. Tap changing is done by means off circuit links accessible through the opening on tank side in case of normal ventilated units. Use of tap changing links eliminates any moving parts as against a manually operated tap changer.

4.10.3 Tap changing mechanism shall be easily accessible and it shall be possible to change the taps without opening the main transformer enclosure.

4.11 MARSHALLING BOX

4.11.1 A marshalling box made with sheet steel of 2.5 mm thick,(CRCA) conforming to IP55 degree of protection or better shall be located near each transformer. The marshalling box shall contain all accessories that are required for the transformer except those that are mounted on the transformer itself. The wiring of all devices shall be brought to stud type terminal block. 15% spare terminals shall be provided. Control wiring shall be done by 2.5 sq.mm. Stranded copper wires. Labels shall be provided for ease of identification. Capillaries for WTI shall be taken in GI flexible and the same shall be terminated on the marshalling ox/thermometer pockets with weatherproof glands.

4.11.2 Following items, apart from regular marshalling box instruments shall be equipped:

- Triple pole line isolating switch
- HRC fuses
- Strip heaters, thermostat controlled with switch
- Cubicle lamp with door switch
- Control circuit **MCB**
- Adjustable wire wound rheostat for winding temperature Indicator
- Mushroom type '**RED**' emergency stop Push button with acrylic Shroud.
- One set of winding temperature shall be fitted locally in the marshalling box of the transformer so as to be readable at a standing height from the ground level. Each winding temperature indicator shall be provided with necessary contacts for alarm on a high set point and for trip on a higher set point. The contacts shall have adequate rating, if used directly in the control circuit, otherwise auxiliary relay shall be provided for the purpose.

4.11.3 The following accessories shall be provided.

- Two temperature-sensing devices in each limb.
- Temperature sensing relay with one contact for alarm and one for trip.
- Indicating platinum resistance type thermo meter with alarm and trip contacts

4.12 TERMINATION ARRANGEMENT:

4.12.1 The HV terminals shall be brought out to a weather-proof self-supporting detachable (disconnecting chamber type with disconnecting links) cable end box. The purchaser reserves the right to go in for disconnecting type HV cable box located at an angle of 90° to the direction of bus duct. The exact terminal arrangement will be intimated at the time of ordering. No extra amount shall be payable for this arrangement. HV cable box shall be phase-segregated type. The phase segregation barriers shall be minimum 3mm the. FRP sheet.

4.12.2 The phase sequence in the LV bus duct flange shall be as per the purchaser's choice and the same shall be decided during the detailed engineering stage.

4.12.3 The cable box shall be complete with gland plate, cable armour clamps etc. The arrangement shall be such as to permit removal of transformer without dismantling bus duct / cable installation.

4.13 NEUTRAL BUSHINGS

Neutral bushing, wherever applicable shall be identical to the phase bushing in all respects i.e. voltage, current rating etc.

LV Neutral terminal for the purposes of earthing shall be brought down, totally insulated by means of epoxy insulator supports, up to the skid level. The rating of the earth bushing shall be similar to the phase bushing.

The material for LV neutral & LV earth bushing shall be of moulded epoxy type.

4.14 PAINTING

All steel surfaces shall be thoroughly cleaned by sand blasting or chemical agents as required to produce a smooth surface free of scale, grease and rust. The external surface, after cleaning, shall be given a coat of high quality red oxide or yellow quoted primer, followed by filler coats. The transformer shall be finished with two coats of synthetic enamel paint. The colour of final paint shall be pebble grey Shade RAL 7032.

4.15 CLEARANCES

The electrical clearances shall be maintained as per I.E regulations. The design of the transformer/the height of the bushing/location of the conservator shall be chosen/carried out considering the electrical clearances stipulated.

There shall not be any structure/piping etc., which may foul with the vertical uptake of the LV bus duct. LV bus duct, in no case shall be deviated from vertical direction.

5.0 NOISE

The Max. Audible Sound Level measured at standard distance from the external surface of the transformer shall be as follows.

500 KVA- 2500 KVA - 65 db.

6.0 INSTALLATION

- The transformer shall be installed as per the manufacturers instruction manual and shall conform to the requirements of IS 1886-1967.
- The transformer foundations shall be cast as required. If any lifting is required, the same shall be done by all the lifting lugs to avoid any imbalance.
- The transformer wheels shall be locked by suitable locking arrangement to avoid accidental movement after testing and commissioning.
- The transformer cable end boxes shall be sealed to prevent entry of moisture.
- The transformer neutral and body earthing shall be as per the requirements of IS 3043-1966 and the Local Inspecting Authorities

7.0 Type Test Certificate

Transformer configurations offered shall be CPRI /Independent accredited agency tested. Copies of the type test certificates of the type testing for the identical equipment of similar rating shall be submitted by successful Tenderer at the time of obtaining Vender approval. This shall not be more than 5 years old.

If the Type Test Certificate are not available for the identical equipment of similar ratings, the Type Test have to be conducted and Test Certificates shall be submitted

8.0 COMMISSIONING TESTS

The following tests shall be carried out prior to commissioning at site.

- Insulation resistance of the winding between phases and phase and earth on the H.T. side.
- Winding resistance of all the windings on all tap positions.
- Voltage ratio test shall be carried out by applying low voltage on H.T. side and measuring the voltage between phases and phase and neutral on the L.T. side for every tap setting.
- If necessary the transformer shall be heated by applying low voltage on the H.T. side and shorting the L.T. side. This shall be done for a period of 48 hours or till all the moisture has been removed from the transformer.
- On commissioning of the transformer the following readings shall be taken
 - L.T. side voltages at all tap settings
 - Temperature rise under no load conditions

**SPECIFIC REQUIREMENT SHEET FOR
CAST RESIN DRY TYPE TRANSFORMERS**

1a	Capacity (Subject to Variation in load)	
1b	Quantity	Refer Latest BOQ
2	TYPE OF TRANSFORMER	
a	Indoor/Outdoor	Indoor
b	Winding	Double
c	Winding Material	Electrolytic Copper
d	Cooling method	AN
e	Core/Shell type	Core type
3	Number of Phase	3
4	Supply frequency	50Hz \pm 3%
5	Voltage ratio	11000/433 volts at normal tap
6	Frequency variation	\pm 3%
7	Voltage variation	\pm 10%
8	Connections	
a	High voltage	Delta
b	Low voltage	Star with Neutral solidly grounded
9	Vector group	DYN11
10	Type of tap Changer	Off-circuit on HV side
11	No. of taps, range and % variation per tap	+7.5% to -10% in steps of 2.5%

12	Temperature rise over an ambient of 50°C	90°C
13	Insulation Class	F
14	Transformer protection class	IP23 or better
15	Enclosure thickness	Min 2mm
16	Percentage impedance	As per IS: 2026 / IS: 11171
17	Design flux density at rated Voltage at tap 0	As per standards
18	Insulation level: Impulse (KV peak)	As per IS
19	Power Frequency	
	HV rms	As per IS
	LV rms	As per IS
20	Fault level of the system (Solidly grounded)	HV – 350MVA LV – 36 MVA
21	Termination arrangement	
a	HV	Weather proof disconnecting chamber type cable box with phase segregated terminal arrangement suitable for 3C x 240 Sqmm XLPE aluminium cable
b	LV	Flange box for TPN aluminium bus duct suitable for taking off vertically/horizontally
c	LV Neutral	Neutral bushing with rating same as the phase bushing
d	LV Neutral bushing	Suitable for connection by 2Nos. for Earthing 75x10 Cu. flat (additional neutral bushing)
22	Accessories	
22.1	Digital Winding Temperature Indicator TR-7570 PECON Make	Yes
22.2	Lifting lugs for Core Coil Assembly	Yes
22.3	Off circuit tap changing Link	Yes

22.4	Rating and terminal marking plate	Yes
22.5	Earthing terminals	Two nos. each for i) Transformer Body ii) Cable box/busduct flange iii) Marshalling box
22.6	Base channel with towing holes/lugs	Yes
22.7	Jacking lugs / Skid	Yes
22.8	Inspection hole	Yes
22.9	Manufacturers' name plate as per cl.no.8.0 of IS:11171	Yes
22.10	Bidirectional flat / flanged rollers	Yes
22.11	Marshalling box	
A	Thickness of sheet steel	2.5 mm
B	Painting	In line with main tank
C	Degree of protection	IP54 or better
D	Gland plate	Undrilled, 3mm thick
E	Spare terminals	15%
22.12	150mm dial winding temperature indicator with maximum reading pointer and alarm & trip contacts with additional contacts for remote annunciation	Not - required
22.13	Loss figures to be considered by the bidder (subject to IS tolerance)	
A	No load loss at rated Voltage & frequency at Principal tap	As per IS
B	Load loss at 75°C at Principal tap	As per IS
23	Service conditions	
A	Location	Indoor
B	Mounting	Ground
C	Special Conditions	Dusty

D	Altitude	590m above MSL
E	Maximum ambient temperature	50° C
24	Acceptance tests and Type tests	All routine test as per IS: 11171 on all units, Heat run test on any one unit on all ratings
25	Inspection	Transformer inspection before despatch
26	Relevant standards	IS:11171, IS:2026 and CBIP Technical report No. 1 and IS:2071 for HV tests
27	Painting	RAL 7032

9. Transformer / LV :

Connections from transformer to LT ACB shall be done with CU/AL busbar connections direct connected between transformer LV bushing and ACB terminal pad.

10. Packing – TRANSPORT AND INSTALLATION

- ◆ Substation shall be delivered in a protective cover made of polythene or similar product.
- ◆ Lifting facilities for transportation of the complete unit shall be provided.
- ◆ Commissioning and operating instructions shall be provided with each substation.

11. TESTS

Routine factory testing, in accordance with IEC standards, shall be conducted including the following :

Routine Tests

- ◆ Check of conformity with wiring diagrams and plans,
- ◆ Mechanical operation tests, and checking of interlocks,
- ◆ Low voltage dielectric tests.
- ◆ Low voltage functional checking.

TS 24 : NETWORKING :

Specifications for Passive Items Cable & others

CAT 6 UTP components should have independent lab verification like ETL, ERTL, ROHS certificates. The cabling should be certified to have application support warranty for next 25 years.

UTP CABLING COMPONENTS (UTPC00X) (Type: 1-5)

Category 6 UTP, 4 Pair

Characteristic	Min. Required Specification
Features	Category 6 Unshielded Twisted Pair 4 pair 100Ω cable shall be compliant with ANSI/TIA/EIA-568-C.2 Additional Transmission Performance Specifications for 4-pair 100Ω Category 6Cabling.
	Category 6 UTP cables shall extend between the work area location and its associated telecommunications closet and consist of 4 pair, 23 AWG, UTP.
	The 4 pair Unshielded Twisted Pair cable shall be UL® Listed
	All Category 6 cables shall meet or exceed the following characteristics:
Mechanical Characteristics	Construction: 4 twisted pairs separated by internal X shaped, 4 channel, polymer spine / full separator. Half shall not be accepted.
	Conductor Solid bare Copper
	Conductor Diameter 0.56±0.005mm (23 AWG)
	Insulation :High Density Polyethylene
	Jacket FR PVC
	Outer Diameter 6.1 mm nominal
	Temperature Range -20° to +70°C

(ii) FACE PLATE

Characteristic	Min. Required Specification
Features	Single & DUAL square plate, Quad in Rectangular shape
	Write on labels in transparent plastic window – supplied with plate
	Screw hole covers – to be supplied with plate
	Face Plate with shutter

	Should be able to support variety of jacks – UTP, STP, Fiber, Coax etc.
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(iii) INFORMATION OUTLET

Characteristic	Min. Required Specification
Features	Category 6, TIA568 C.2
	All information outlets for 100 Ω , 22-26 AWG copper cable shall: Use insulation displacement connectors (IDC)
	Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limits.
	Be constructed of high impact, flame-retardant thermoplastic with color and icon options for better visual identification.
	Shutter is on face plate
	Insertion force: 20N max (IEC 60603-7-4)
	IDC : Housing PC + glass fiber , UL 94 V-2
	568A/B configuration
	Information outlet (RJ45 jack) should be covered under ETL Verification program for compliance with TIA568.C.2 Operation Temp: -10 C to 60 C
	Mechanical : Jack Connector	Plastic Housing: Polycarbonate, UL94V-0 rated or equivalent
Operating Life: Minimum 750 insertion cycles	
Contact Material: Copper alloy	
Contact Plating: 50 μ inches gold on plug contact area	
Plastic Housing: Polycarbonate + glass fiber UL94V-2 rated	
Operating Life: Minimum 200 Re-terminations	

	IDC Contact Plating: Phosphor bronze with tin plated
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(iv) 24 PORT JACK PANEL

Characteristic	Min. Required Specification
Features	Be made of powder coated steel, in 24 port configurations.
	Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limit.
	Have port identification numbers on the front of the panel.
	Should have self adhesive, clear label holders (transparent plastic window type) and white designation labels with the panel, with optional color labels / icons.
	IDC: Suitable for 22-26 AWG stranded and solid wire compatible with both 110 & Krone punch down tools
	Each port / jack on the panel should be individually removable on field from the panel.
	Improved cable management with optional cable management bar
	The Cat-6 transmission performance is in compliance with the ANSI/TIA/EIA 568C.2 standard
Mechanical Characteristics	Plastic Housing: ABS , UL94V-0 rated
Jack Connector	Operating Life: Minimum 750 insertion cycles
	Contact Material: Copper Alloy
	Contact Plating: 50 μ " Gold plated on plug contact area
	Contact Force: 20N max (IEC 60603-7-4)
	Plug Retention Force: 15 lb.
IDC Connector	Plastic Housing: Polycarbonate, UL94V-0 rated or equivalent
	IDC cap : ABS, UL 94V -0
	Contact Material: Copper Alloy
	IDC Contact Plating: Phosphor bronze with tin plated
	Insertion Force: 20N max (IEC 60603-7-4)
	Wire Accommodation: 22-26 AWG solid

(v) MOUNTING CORDS

Characteristic	Min. Required Specification
Features	Category 6 Equipment cords
	The work area equipment cords shall, at a minimum comply with proposed ANSI/TIA/EIA-568-C.2 Commercial Building Cabling Standards Transmission Performance Specifications for 4 pair 100Ω Category 6 Cabling.
	Equipped with modular 8-position modular plugs on both ends, wired straight through with standards compliant wiring.
	Should have 50 micro inches of gold plating over nickel contacts.
	Should be covered by ETL verification program for compliance with TIA 568.C.2
Mechanical – Cable	Conductor size: 24 AWG stranded bare copper
	Max O.D.: 5.6mm (.22")
	Jacket: PVC UL-94V-O
	Temperature range: -10oC to +80oC
Mechanical Characteristics – Plug	Operating life: Minimum 750 insertion cycles
	Contact blade: Phosphor bronze
	Contact plating: 50μ" Gold
	Plug dimensions & tolerances compliant with FCC Part 68.500 and IEC 60603-7
	Approvals: UL 444 for copper conductor
Electrical Characteristics – Plug	Dielectric withstanding voltage :500 V AC
	Insulation resistance : 35 M Ohm (Max)
	Operating temperature: -10oC to 80oC

PVC Telephone cable: PVC insulated Tinned copper solid conductor with minimum 0.5mm dia. (Single & Multi pair) properly paired and colour coded, shall be terminated on

KRONE module with suitable tool.

Jelly filled Armoured Telephone cable: PVC insulated, PVC sheathed with steel armouring, Tinned copper solid conductor with minimum 0.5 mm dia multi pair, with Jelly, properly paired and colour coded.

Saddles: Saddles fabricated from GI sheet of required gauge (16/18 gauge) either galvanized finish or painted with superior quality enamel black paint, with necessary shearing for mechanical strength, semi circular shaped with extended piece having suitable holes for fixing on spacer.

Hardware: Sheet Metal (SM) screws of required sizes, plugs, wooden gutties, etc.

MDF: Manufactured by reputed manufacturer of specified capacity, facility for wall mounting, with door & lock, aluminium frame for fixing of KRONE, duly enclosed in cabinet made from 18 SWG CRCA sheet with powder coating of required colour.

Junction box: Manufactured by reputed manufacturer of specified capacity, facility for + wall mounting, with door & lock, aluminium frame for fixing of Krone, duly enclosed in cabinet made from 18 SWG CRCA sheet with powder coating of required colour. The depth of the box should consider the height of KRONE module plus protection magazine.

Over Voltage protection Magazine: Manufactured by reputed manufacturer of 10 pair capacity, with 3 pole gas discharge tube should be properly fitted on KRONE module in MDF / Junction box.

Rosette box: PVC or Bakelite box with LED indicator, RJ 11 jack, facility for fixing on wall.

Jumper wire: Twin twisted PVC insulated with Tinned copper solid conductor minimum 0.5 mm dia.

KRONE Module: Disconnection type KRONE module having capacity to connect 10 pairS with silver-plated terminal contacts.

RG-11 Co-axial low voltage grade cable: PVC insulated with Tinned copper solid conductor minimum 0.5 mm dia, with connector at both ends suitable for termination in RJ type socket

Erection of Jelly filled armoured Telephone cable:

Erection shall be done as per the layout finalized, in perfect level and plum. Before fixing the cable shall be straightened as far as possible for good aesthetics look. Cable shall be fixed with saddles firmly clipped on cable. Saddles shall be fixed to wall with minimum 50x8mm SM screws with plugs/wooden gutties (Distance between two saddles shall be minimum 600 mm). Wooden gutties shall be used wherever required (Especially for stone wall). The entries made in wall, floor slab, etc for laying the cable shall be made good by filling and finishing with plastering the same.

Erection of MDF Junction box / Rosette box / PBX / EPABX, etc: Specified equipment shall be fixed to wall with minimum 50x8 mm SM screws, with necessary plugs, wooden gutties, etc. or may be fixed on Table Top if required.

Ethernet Switch:

Ethernet Switch with PoE: 48 ports PoE (Power Over Ethernet) with IEEE 802.3af PoE protocol, each PoE to supply up to 15.4 Watts for connecting devices such as Access Point needing additional power, 10/100Base-Tx 48 Fast Ethernet ports, 1000 Base-T 4 ports, 4 combo ports for flexible copper/fibre Gigabit connections, VLAN web manageable switch with rack mountable clips, screws, console utility software, mechanisms to detect an attack against the central processing unit of the switch and to take corrective action on attacking interface.

1. Feature-rich solution with functionality enabling by Secure Always On access to mission critical applications
2. High performance switch architecture and stacking performance delivering 320Gbps
3. High-density 10/100 ports for edge connectivity
4. Two combo 10/100/1000/SFP uplinks ports per switch for high speed gigabit or low speed connections such as 100FX
5. Simplified converged network deployments through support for Power over Ethernet (PoE), advanced Quality of Service (Quos), and auto-configuration of ports with IP

Handsets & Wireless Access Points

Technical Specifications:

- 10/100 Power over Ethernet ports: 48 per switch
- 10/100/1000/SFP Gigabit ports: 4 per switch
- SFP support: SX, LX, XD, ZX, CWDM, 100FX, & T1
- Resilient Stacking: up to 8 units / 192 ports per stack
- Stacking ports: 2 built-in stacking ports per switch
- Total stacking capacity: 320 Gbps
- Individual switch packet throughput: 6.6 Mpps
- Individual switch capacity: 48.8Gbps
- Concurrent VLANs: 256
- Jumbo Frame Support on Gigabit ports
- Maximum MAC addresses: 8,000

Standards Compliance:

- IEEE 802.3 10BASE-T Ethernet
- IEEE 802.3u 100BASE-TX Fast Ethernet
- IEEE (ANSI) 802.3 Auto-negotiation
- IEEE 802.3z Gigabit Ethernet
- IEEE 802.3x Flow Control
- IEEE 802.1Q VLANs
- IEEE 802.1p Priority Queues
- IEEE 802.1D Spanning Tree
- IEEE 802.1w Rapid Spanning Tree
- IEEE 802.1s Multiple Spanning Tree Groups
- IEEE 802.3ad Link Aggregation
- IEEE 802.1X Ethernet Authentication Protocol
- IEEE 802.3AB Link Layer Discovery Protocol

- RFC 783 Trivial File Transfer Protocol (TFTP)
- RFC 791/950 Internet Protocol (IP)
- RFC 792 Internet Control Message Protocol (ICMP)
- RFC 826 Address Resolution Protocol (ARP)
- RFC 854 Telnet Server and Client
- RFC 951 / 1542 BOOTP
- RFC 1112 Internet Group Management Protocol v1
- RFC 1215 SNMP Traps Definition
- RFC 1271 / 1757 / 2819 RMON
- RFC 1361 / 1769 Simple Network Time Protocol (SNTP)
- RFC 1493 Bridge MIB
- RFC 1573 / 2863 Interface MIB
- RFC 1643 / 2665 Ethernet MIB
- RFC 1905 / 3416 SNMP
- RFC 1906 / 3417 SNMP Transport Mappings
- RFC 1907 / 3418 SNMP MIB
- RFC 1945 HTTP v1.0
- RFC 2011 SNMP v2 MIB for IP
- RFC 2012 SNMP v2 MIB for TCP
- RFC 2013 SNMP v2 MIB for UDP
- RFC 2138 RADIUS
- RFC 2236 Internet Group Management Protocol v2
- RFC 2474 Differentiated Services Support
- RFC 2570 / 3410 SNMPv3
- RFC 2571 / 3411 SNMP Frameworks
- RFC 2572 / 3412 SNMP Message Processing
- RFC 2573 / 3413 SNMPv3 Applications
- RFC 2574 / 3414 SNMPv3 USM
- RFC 2575 / 3415 SNMPv3 VACM
- RFC 2576 / 3584 Co-existence of SNMP v1/v2/v3
- RFC 2660 HTTPS (Secure Web Server)
- RFC 2665 Ethernet MIB
- RFC 2863 Interfaces Group MIB
- RFC 2674 Q-Bridge MIB
- RFC 2737 Entity MIBv2
- RFC 2819 RMON MIB

Additional features:

- Customizable Auto-negotiation Advertisements (CANA)
- Distributed Link Aggregation Groups
- Virtual Link Aggregation Control Protocol (VLACP)
- Single IP address for stack management
- Resilient fail-safe stacking
- Automatic Unit Replacement (Configuration and Software)
- Automatic Detection Automatic Configuration (ADAC)
- 802.1X Single Host Single Authentication
- 802.1X Single Host Multiple Authentication
- 802.1X Multiple Host Multiple Authentication

- 802.1X Guest VLAN
- 802.1X Non-EAP (NEAP) access
- DSCP-based Recognition, Marking and Recolouring
- Ingress and Egress Port Mirroring
- Broadcast and Multicast Rate limiting per port
- ASCII Configuration File
- Web, NNCLI, JDM
- SSHv2 and SNMPv3 secure management support
- Secure Network Access (NSNA) support
- BPDU Filter
- Stack Monitor
- USB software and ASCII configure upload
- New unit quick to configure

Resiliency Features:

- Should support a technology which will allow multiple physical network links between two network switches and another device (which could be another switch or a network device such as a server) to be treated as a single logical link and load balance the traffic across all available links
- Generally all the physical ports in the link aggregation group must reside on the same switch. It should also support protocols remove this limitation by allowing the physical ports to be split between two switches.
- Load balancing mechanism should not be round robin or dynamic which may not work with applications like Voice & Video, where session persistence is must.

Main Objective of above features is to achieve Active-Active Cluster Switching. And achieve sub second fail over in case of Link failure & Device Failure, which will result in 99.999% uptime.

Power over Ethernet specifications:

- 802.3af compliant with Power classification support
- Signal pair power delivery
- Maximum 15.4 watts per port
- Maximum DTE Power AC 320 watts
- Maximum DTE Power AC + RPS 740 watts

Electrical specifications:

- Power supply: AC 100-240V, 50-60Hz
- Input current at 110v: 7.1A
- Input current at 220v: 3.6A
- Max power consumption: 940W

Dimensions:

- Width: 876.4mm
- Height: 2RU 87.4mm
- Depth: 736.6mm

Environmental specifications:

- Operating temperature: 0 to 50 degrees C
- Storage temperature: -25 to 55 degrees C
- Relative humidity: 10% - 90%vnon-condensing

- Peak noise level: 42.3 dB
- Thermal rating: 375 BTU/hr
- Calculated MTBF: 242,552 hrs

Safety Agency Approvals:

- IEC 60950 International CB Certification
- EN 60950 European Certification
- UL60950 US certification
- CSA22.2, #60950 Canadian Certification
- NOM Mexican Certification

Electromagnetic Emissions and Immunity:

- CISPR22, Class A/CISPR24 International
- EN55022, Class A/EN55024 European
- FCC, Part 15, Class A US Certification
- ICES-003, Class A Canadian Certification
- AN/NZS 3548 Australian/NZ Certification
- BSMI - Taiwan - CNS 13438, Class A
- MIC - Korea - MIC, No. 2001-116
- VCCI Class A Japanese Certification

Hardware: Chromium plated brass nuts & bolts with special type of U shaped square washers of required sizes.

Method of construction:

The Ethernet switch fitted with rack mountable clips shall be fixed in U Rack (Networking Cabinet) with 4 nos. of chromium plated brass nuts & bolts. The switch shall be configured for TCP/IP addresses for switch IP & Gateway.

Mode of measurement: Executed quantity shall be counted on number basis

TS 25 : VOICE & DATA :

Specifications for Passive Items Cable & others

CAT 6 UTP components should have independent lab verification like ETL, ERTL, ROHS certificates. The cabling should be certified to have application support warranty for next 25 years.

UTP CABLING COMPONENTS (UTPC00X) (Type: 1-5)

(i) Category 6 UTP, 4 Pair

Characteristic	Min. Required Specification
Features	Category 6 Unshielded Twisted Pair 4 pair 100Ω cable shall be compliant with ANSI/TIA/EIA-568-C.2 Additional Transmission Performance Specifications for 4-pair 100Ω Category 6Cabling.
	Category 6 UTP cables shall extend between the work area location and its associated telecommunications closet and consist of 4 pair, 23 AWG, UTP.
	The 4 pair Unshielded Twisted Pair cable shall be UL® Listed

	All Category 6 cables shall meet or exceed the following characteristics:
Mechanical Characteristics	Construction: 4 twisted pairs separated by internal X shaped, 4 channel, polymer spine / full separator. Half shall not be accepted.
	Conductor Solid bare Copper
	Conductor Diameter 0.56±0.005mm (23 AWG)
	Insulation :High Density Polyethylene
	Jacket FR PVC
	Outer Diameter 6.1 mm nominal
	Temperature Range -20° to +70°C

(ii) FACE PLATE

Characteristic	Min. Required Specification
Features	Single & DUAL square plate, Quad in Rectangular shape
	Write on labels in transparent plastic window – supplied with plate
	Screw hole covers – to be supplied with plate
	Face Plate with shutter
	Should be able to support variety of jacks – UTP, STP, Fiber, Coax etc.

(iii) INFORMATION OUTLET

Characteristic	Min. Required Specification
Features	Category 6, TIA568 C.2
	All information outlets for 100 Ω, 22-26 AWG copper cable shall:
	Use insulation displacement connectors (IDC)
	Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limits.
	Be constructed of high impact, flame-retardant thermoplastic with color and icon options for better visual identification.
	Shutter is on face plate
	Insertion force: 20N max (IEC 60603-7-4)
	IDC : Housing PC + glass fiber , UL 94 V-2
	568A/B configuration
	Information outlet (RJ45 jack) should be covered under ETL Verification program for compliance with TIA568.C.2 Operation Temp: -10 C to 60 C
Mechanical : Jack Connector	Plastic Housing: Polycarbonate, UL94V-0 rated or equivalent
	Operating Life: Minimum 750 insertion cycles
	Contact Material: Copper alloy
	Contact Plating: 50 pinches gold on plug contact area
	Plastic Housing: Polycarbonate + glass fiber UL94V-2 rated
	Operating Life: Minimum 200 Re-terminations
	IDC Contact Plating: Phosphor bronze with tin plated

(iv) 24 PORT JACK PANEL

Characteristic	Min. Required Specification
Features	Be made of powder coated steel, in 24 port configurations.
	Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limit.
	Have port identification numbers on the front of the panel.
	Should have self adhesive, clear label holders (transparent plastic window type) and white designation labels with the panel, with optional color labels / icons.
	IDC: Suitable for 22-26 AWG stranded and solid wire compatible with both 110 & Krone punch down tools
	Each port / jack on the panel should be individually removable on field from the panel.
	Improved cable management with optional cable management bar
	The Cat-6 transmission performance is in compliance with the ANSI/TIA/EIA 568C.2 standard
Mechanical Characteristics Jack Connector	Plastic Housing: ABS , UL94V-0 rated
	Operating Life: Minimum 750 insertion cycles
	Contact Material: Copper Alloy
	Contact Plating: 50 μ " Gold plated on plug contact area
	Contact Force: 20N max (IEC 60603-7-4)
	Plug Retention Force: 15 lb.
IDC Connector	Plastic Housing: Polycarbonate, UL94V-0 rated or equivalent
	IDC cap : ABS, UL 94V -0
	Contact Material: Copper Alloy
	IDC Contact Plating: Phosphor bronze with tin plated
	Insertion Force: 20N max (IEC 60603-7-4)
	Wire Accommodation: 22-26 AWG solid

(v) MOUNTING CORDS

Characteristic	Min. Required Specification
Features	Category 6 Equipment cords
	The work area equipment cords shall, at a minimum comply with proposed ANSI/TIA/EIA-568-C.2 Commercial Building Cabling Standards Transmission Performance Specifications for 4 pair 100 Ω Category 6 Cabling.
	Equipped with modular 8-position modular plugs on both ends, wired straight through with standards compliant wiring.
	Should have 50 micro inches of gold plating over nickel contacts.
	Should be covered by ETL verification program for compliance with TIA 568.C.2

Mechanical – Cable	Conductor size: 24 AWG stranded bare copper
	Max O.D.: 5.6mm (.22")
	Jacket: PVC UL-94V-O
	Temperature range: -10oC to +80oC
Mechanical Characteristics – Plug	Operating life: Minimum 750 insertion cycles
	Contact blade: Phosphor bronze
	Contact plating: 50μ” Gold
	Plug dimensions & tolerances compliant with FCC Part 68.500 and IEC 60603-7
	Approvals: UL 444 for copper conductor
Electrical Characteristics – Plug	Dielectric withstanding voltage :500 V AC
	Insulation resistance : 35 M Ohm (Max)
	Operating temperature: -10oC to 80oC

Optical Fiber Multi Mode Cable

FIBER CABLING COMPONENTS (FMCC00X)(Type: 1-6)

(i) Optical Fiber Cable

Multi-Mode (MM) Fiber, Standard properties

Description	Unit	OM2
Performance Characteristics:		
Bandwidth @850nm	MHz*km	>/= 500
Bandwidth @1300nm	MHz*km	>/= 550
Effective Modal Bandwidth @850nm	MHz*km	
Transmission link lengths for 10Gb/s @850nm @1300nm(LX4)		no 1Gb link length
at 850nm operating wavelength with transmitters meeting encircled flux		
Optical Characteristics:		
Atten. Coefficient @850nm	dB/km	</= 2.500
Atten. Coefficient @1300nm	dB/km	</= 0.700
Atten. At 1383nm (OH-Peak)	dB/km	</= 2.0
Atten. discontinuities (OTDR 1300nm)	dB/km	<0.05
Macrobend	dB	</= 0.5
Zero Dispersion Wavelength	nm	
Zero Dispersion Slope :-		

1295 $\leq\lambda\leq$ 1300	ps/nm.km	
1300 $\leq\lambda\leq$ 1320	ps/nm.km	
Numerical Aperture		0.200 \pm 0.015
Effective Group Index of Refraction 850nm 1300nm		1.483 1.478
Geometrical Characteristics:		
Core Diameter	um	50 \pm 2.5
Core Non-Circularity	%	(\leq) 3.0
Core /Clad Concentricity Error	um	(\leq)1.5
Cladding Diameter	um	125 \pm 1.0
Cladding Non-Circularity	%	(\leq) 1.0
Coating Diameter	um	245 \pm 10.0
Coating /Clad Concentricity Error	(\leq) um	12.5
Mechanical Characteristics:		
Dynamic Tensile Strength :-		
Unaged Fiber (0.5m) :-		
Median Tensile Strength	Gpa	\geq 3.8
15th Percentile Tensile Strength	Gpa	\geq 3.3
Aged Fiber (0.5m) :-		
Median Tensile Strength	Gpa	\geq 3.03
15th Percentile Tensile Strength	Gpa	\geq 2.76
Dynamic Fatigue Stress Corrosion Parameter n		\geq 20
Operating Temperature Range		(-)60oC to(+)85oC
Coating Strip Force (typical)	N	1.9
Proof Test	Kpsi	\geq 100
	N	\geq 8.8

Environmental Characteristics:		
At 850/1300nm		
Change of Temperature Attenuation increase, -60°C to +85°C	dB/km	<= 0.20
Dry Heat Attenuation increase, 30 days at 85°C	dB/km	<= 0.20
Damp Heat Attenuation increase, 30 days at 85°C/ 85%R.H.	dB/km	<= 0.20
Water Immersion Attenuation increase, 30 days in 23°C water	dB/km	<= 0.20

(ii) FIBER PATCH PANELS – RACK MOUNT

Characteristic	Min. Required Specification
	Slim 1 Unit Mounting Height
	Front-mounted cable saddles for jumper management
	Can manage both splices and terminations
	Preassembled shelves in multiple configurations
	Can include adapter panels for maximum 48 LC, 24 SC, 24 ST or 24 FC terminations
	Rubber fiber slotted bracket built-in, metal splice shelf to protect the fibers
	2 fiber spools built-in for 900µm tight buffered fiber storing
	Capable of storing up to 3 meters of 900µm tight buffered fiber per adapter
	Snap-in locker design, easy to change adapter panels for various connector patching
	Removable front and rear covers for better access to interior of LIU
	Removable rubber grommet allows for pre-terminated fiber trunk installation, protects cable and minimizes dust build-up

	Aluminium base material for light mounting
	Accessory kit consists of cable ties, mounting ear screws, and spiral wrap tube

(iii) ADAPTORS

Characteristic	Min. Required Specification
Features	All SC/LC/FC adaptors should be Simplex and duplex type. Adapters should have compact design & high precision, which perform well under various circumstances & maintain good plug retention strength.
	Telcordia, TIA/EIA, IEC compliance
Insertion Loss	0.20db for Zirconia Sleeve
Sleeve/Ferrule Withdrawal Force	SC / FC Adapter 2.0N ~ 5.9N , LC Adapter-1.0N ~ 2.5N

(iv) Optical Fiber Connectors

Measure	SC Connector
Insertion Loss dB (Multi Mode)	< 0.3
Return Loss	> 50dB UPC Style Ferrule > 60dB APC Style Ferrule
Pigtail Boot	900µm beige
Cable Boot	3mm beige
Mating Cycle	Up to 1000 times
Ferrule Diameter	2.5mm ± 0.001
Ferrule Tolerance Multi Mode	127 ± 0.5µm internal
Finish	Pre-radiused PC end, radius 10 to 25mm
Operating Temperature	-40°C to + 85°C
Meet Standard	IEC61754-20 Optical Fiber Connector Interface
Durability	IEC61300-2-2 Fiber Optic Interconnecting Devices
Performance	IEC61753-1 Optical Fiber interconnecting devices and passive components performance standard

(v) Optical Fiber Equipment Cords (minimum 3 meter)

Characteristic	Min. Required Specification
Features	Adopted high precision ceramic ferrule with good concentricity

Good Geometrical characteristics of apex offset & radius of curvature & fiber height
Compact & Strong crimping offers exceptional tensile strength in cable assemblies
100% inspected for optical characteristics & fiber end face finish.
Low insertion loss & return loss, clean and scratch free end faces
Good performance endurance under changing circumstances
Insertion loss: Typical: <0.2db, Max .03 db
Return Loss: > 30db
Apex offset: < 50um
Fiber height: +- 100nm
Repeatability: < 0.2db 1,000 times mating cycles
Optional temperature: -40oC to +85oC
Storage Temperature: -40oC to +85oC

SR. NO.	ITEM	MAKE
2	L.T. Cables	RR / Polycab / KEI / Rajanigandha / Avocab / Havells
3	Cable Trays	OBO BETTERMAN /Profab / Indiane
4	Busducts & Rising Mains	Translite / Schneider / L&T / EAE
5	ACB (Air Circuit Breakers)	Siemens / Schneider / L & T / ABB / Havells
6	MCCB's (Moulded care circuit breaker)	Siemens / Schneider / L & T / ABB / Havells
7	MCB's & ELCB's	Siemens / Schneider / L & T / ABB/ Havells
8	Indicating Lamps	Teknic / AE / Siemens
9	Digital Meters	Enercon / Krycard / CONZERV
10	Contactors	Siemens / Schneider / L & T /ABB
11	Auto Changeover Contactor	ABB / L & T/ Schneider
12	Capacitors	Epcos – Siemens / ABB / GE
13	Galvanised Conduit & Accessories	AKG / Vimco / PEW / PEI

14	PVC Conduit & Accessories	AKG /Precision Plastic Industries / Polycab / Avoplast / BEC
15	M. S. Conduit & Accessories	AKG /PEW / PEI
16	UPVC Pipes	Finolex
17	Wiring Accessories	MK / North West / CRABTREE
18	CU Conductors PVC insulated Wires	RR / POLYCAB / KEI / Rajanigandha / Havells
19	Light Fixtures (LED – Indoor & Outdoor)	PHILIPS / WIPRO / K-lite / Oxiona / Bajaj / CG / Havells / Kaselec-Schreder / Venture / Home Deck
20	PVC Trunking	OBO BETTERMAN / MK / Legrand
23	UPS & Inverter	APC / Emeson Power/ Delta
24	Telephone Cables	RR / Polycab / KEI / Rajanigandha / Avocab / Havells
25	Metal Clad Sockets	Siemens / Schneider / L & T / ABB / Havells
26	Cable Junction Boxes	Hensel / Spelseberg / Clipsal / Scame
27	Onload & Offload Changeover Switch	HPL / Socomec / L & T / ABB / Schneider / Havells
28	Single & Double compression Glands	Comet / Gripewell /Jainson/Dowells
29	Lugs	Comet / Gripewell /Jainson/Dowells
30	Ceiling Fans	CG / Usha / Havells / Almonard
31	Exhaust Fan	CG / Usha / Havells / Almonard
32	Compact Substation	Siemens / Schneider / ABB / Voltamp
33	HT RMU / Switchgear	Siemens / Schneider / ABB
34	Transformer	Voltamp / Kirloskar / ABB / Schneider
35	LAN – Cat 6 Wires	Panduit / Molex / D-link / Tyco
36	Patch Panels , IOS	Panduit / Molex / D-link / Tyco
37	D. G. Set	Cummins / Caterpillar / Kirloskar / Stamford / Leroy Somer

38	Earthing Pits	Ashlok / Erico / JK / Galaxy
39	Lightning Arrestor	OBO Betterman / Erico / Galaxy
40	Decorative Street Light Poles	K-lite / Home Deck
41	Solar Power System	Tata BP / Bhel / REIL / Niloy
42	KWH Meter / Load Manager	Enercon / Schneider / HPL / Trinity / Krykard
43	CCTV Cameras	Hikvison / Pelco / CP plus / Duhawo / Honeywell
44	Fire Alarm System	Honeywell / Ravel / Siemens
45	PA System	Honeywell / Bosch / Siemens

SCOPE OF WORK

The scope of work for fire fighting contractor includes the following. Although this work is reflected in the bills of quantities the contractor shall be deemed to have considered all such things so as to provide complete systems per requirements of the Chief Fire Officer and any inadvertent omission of anything in the bills of quantities will not entitle the contractor for extra claims. The system consists of fire hydrant system. Technical specifications enclosed herewith shall be followed strictly so far as the workmanship is concerned.

FIRE HYDRANT SYSTEM

1. Provide and install in position pumps of required capacity and specifications in the pump house and at the terrace level.
2. Provide 150 dia HEAVY DUTY MS piping within the pump house for suction and delivery including all fabricated or flanged fittings like tapers, bends, tees etc. as required and directed.
3. Provide and install C.I. double flanged valves like foot valves, sluice valves and non return valves in the pump house and elsewhere in the system.
4. Provide and fix pressure guages on the pump deliveries.
5. Support the wet riser horizontally along the ceiling where ever by means of M.S. Hanger rods.
6. Take the 150 dia HEAVY DUTY MS wet riser through the space provided near the staircase upto the topmost floor .
7. Support the riser by U bolts fixed to M.S. angle bracket at every floor.
8. Take the fire fighting main to run it below the ground level for providing courtyard hydrants on all corners of the building and Mela ground.
9. Provide 150 x 100 tees at every floor or landing with a standard flange welded to the 100 dia tee with holes drilled to match the holes of the hydrant valve flange for fixing the valve.
10. Provide and fix orifice plates to reduce pressure on valves upto 5.5 kg. per sq.cm.
11. Provide and fix 65 dia SS single hydrant valve to the 100 dia branch provided on each floor to the wet riser.
12. Provide and fix 30 m long 20 mm dia first aid hose reel of flexible rubber with shut off nozzle wound round a swivel at every floor above the hydrant valve and connecting one outlet of the twin hydrant to first aid hose.
13. Provide 2 lengths of 65 dia canvass hose reel 15 m long with couplings adapter branch pipe and nozzle.
14. Provide and fix hoses in item no.13 above in a metal box (M.S.) with lockable glass doors and painted in red colour at a location clearly visible on ground or stilt floor.
15. Providing and fixing oblique single hydrants to the hydrant standposts for courtyard hydrants around the buildings.
16. Providing and fixing 25 dia G.M. drain valve at the foot of the wet riser and required length of 25 dia HEAVY DUTY MS pipe to discharge into underground tank or in the storm drain.
17. Providing and fixing 4 nos. 65 dia fire department breaching inlet near the compound wall and facing the road and connecting the same to the underground fire fighting tank by 150 dia HEAVY DUTY MS pipe discharging above water level.
18. Provide 150 dia branch from the wet riser within the pump house to the underground tank along with 100 dia sluice valve for testing purposes.
19. To provide electrical panel in the pump house for fire hydrant pump, sprinkler pump, jockey pump etc.

20. Providing and fixing 2 inlets to the wet riser for connecting the mobile fire engine of the fire fighting department at ground level.

PORTABLE EQUIPMENT (HAND APPLIANCES) :

1. Providing 12 nos. of sand buckets of 9 litres capacity.
2. Providing 2 nos. of dry powder extinguishers 5 kg. capacity.
3. Providing 8 nos. of dry powder extinguishers 10 Kg capacity.

TECHNICAL SPECIFICATIONS

(I) PIPES AND FITTINGS – INSTALLATION

A) FIRE HYDRANT SERVICE – EXTERNAL AND INTERNAL PIPE WORK

1. The layout of the hydrant system shall be as per TAC rules and as approved by the Fire Officer, so as to achieve a minimum pressure of 3.2 kgs./sq.cm. at the highest/hydraulically remotest hydrant point in the building/complex. (A set of approved drawings must be submitted to CFO before commencement of work).
2. All pipes above ground/underground shall be mild steel, Heavy grade 'C' class conforming to IS : 1239 (Part I) upto 150 NB and carbon steel conforming to IS : 3589 (commercial quality) with minimum wall thickness (TW II) or 6mm for size 200 mm NB and above, as required by the local fire brigade authority and as per TAC regulations. The contractor shall furnish manufacturer's certificates for all pipes used in the installation before commencement of fabrication and installation.
3. Mild steel conforming to IS : 1239 (Part II) heavy class upto 150 NB. Fittings above 150 NB size shall be fabricated out heavy class pipe with butt welded ends. Flanges shall be flat face plate flanges with thickness and other details as per ANSI and drilled to IS : 1538. Mitered bends in 200 NB, as required, shall be fabricated at site from pipes of similar size (2 % of shop joints and 100 % of all field joints must be radiographed subject to conditions that total number of joints radiographed are 10 % or total joints and radiographic certificates must be submitted to the owner.)
4. Cast iron flanged Sluice/Gate valves as shown in the drawing shall be provided in the hydrant mains and risers. The valves shall conform to IS : 780 PN.I. The valves must bear ISI mark and hydraulically tested to pressure of 10.54 kgs/sq.cm. when installed. Shop tests shall be as per IS : 780 PN.I. 'Body' tested to 15 kgs/sq.cm. and the valve seat to 10 kgs/sq.cm. All underground valves must be provided with brick masonry valve chambers with heavy type cast iron covers to facilitate maintenance and having an area of 1 sq.m. minimum.
5. All pipes shall be first cleaned and wire brushed. The above ground pipes and fittings shall be given two coats of red primer and one coat of 'Red' paint as per TAC/Fire Authority regulations.
6. All underground pipes and fittings shall be coated and wrapped as per IS : 10221 and TAC regulations in the following manner :-
 - a) Thorough and complete cleaning of the pipe surface.
 - b) Priming by coal tar primer.
 - c) Coating by coal tar primer.
 - d) Inner wrapping with glass fibre.
 - e) Second coating by coal tar enamel.
 - f) Second wrapping with, glass fibre.
 - g) Final coat of coal tar enamel.

- h) Outer wrap of Kraft paper or equivalent.
 - i) Holiday test for coated pipes must be carried out. The holiday test is a high voltage.
 - j) Spark test using a holiday testing machine to ensure that the coating and wrapping of Pipes are done uniformly without any dry batch.
7. Both above ground and underground pipes shall adequately/firmly supported at regular intervals as per standards, brackets with suitable anchor fasteners, duly approved by owner/Fire Authority/TAC. In the case of underground pipes, brick masonry/PCC concrete supports as specified shall be provided at a distance not more than 2.5 to 3.00 meters apart depending upon the "nature of soil in the area". The pipes laid underground shall be 1.00 m (Top of pipe line) below ground level.
 8. The entire pipe work when completed is to be furnished with a pressurised water system. After flushing the installation the same should be hydraulically tested to a pressure equivalent to 1.5 times the maximum working pressure for a period of two hours i.e. kg/sq.cm.
 9. Hydrant Accessories such as G.M. hydrant valve, fire hoses with G.M. coupling, branch pipes with nozzles, hose reels etc. shall be of approved make and conforming to relevant Indian standards and requirements of TAC, and Fire Authority.

A) FIRE AUTHORITY REQUIREMENTS

1. Siamese Connection :

The storage tank will be provided with 150 mm Fire Brigade Siamese Connection to discharge at least 1800 litres of water per minute into the tank. This connection shall not be taken directly into the side of the storage tank but arranged to discharge not less than 150 mm above the top edge of the tank. The connection shall be fitted with a stop valve. An overflow connection shall be fitted with stop valve. An overflow connection discharging to a visible drain point shall be provided.

2. Fire Brigade Connection :

The fire brigade connection approvals of shall be fitted with 4 nos. of 63 mm instantaneous inlets in a glass fronted wall box at a suitable position at street level so located as to make inlets accessible. The size of the wall box shall be adequate to allow hose to be connected to the inlets even if the door can not be opened and the glass has to be broken. Each box shall have fall of 25 mm towards the front of its base and shall be closed with wired glass with "THE FIRE BRIGADE INLET" painted on the inner face of the glass in 50 mm size Block Letters or alternatively suitable stickers may be fixed.

A) FIRE PUMPS

B)

1. Pump shall be provided with a pressure guage on the delivery side between the pump and the non return valve and a plate indicating the delivery head capacity and the number of revolutions per minute, and all other details which the manufacturer has to provide as per relevant Indian Standards.
2. Pump shall be capable of furnishing not less than 150 % of rated capacity at a head of not less than 65 % of the rated head. The shut off head shall not exceed 120 % of rated area in the case of horizontal pumps. Such pumps shall be of TAC approved make.
3. The capacity of Jockey pump to take of minor leakages shall not be less than 180 liters per minute capacity.

A) SLUICE/GATE/CUT-OFF VALVES

These valves conforming to IS: 780 PN1 are necessary to obtain the best possible pressure at the seat of fire and also enable a portion of the installation to be isolated while full pressure is available throughout the remainder.

B) HYDRANTS

All hydrants outlets shall be situated 1 M above ground/finished level conforming to following IS codes :

G.M. Hydrant Valve 65 mm (2.5 inches) I.S. : 5200 5210

also known as landing valve.

65 mm G.M. Branch pipe with nozzle I.S. : 903

and G.M. Hose couplings.

65 mm Reinforced Rubber Lined (RRL) I.S. : 636 Type II A 15.636

Type A

19 mm NB First Aid Hose (For Hose Reel) I.S. : 884

Reinforced rubber hose pipe.

M.S. Fabricated Hose Cabinet/Box M.S. 16 SWG Sheet Steel and

3 mm glass panel for front door.

C) STAND POSTS

- 1) The stand posts on the external hydrant system either single or double headed with bend or tee as the case may be, shall be in 80 mm or 100 mm in dia and painted fire red and numbered for easy identification.
- 2) Only oblique type hydrant with outlet angled towards ground or floor shall be used. The hydrant coupling male and female shall be of instantaneous spring lock type and valves shall be of the screw down type. The hydrant head stand post shall be positioned at distances not less than 2 m from the face of the building or edge of the storage plot to be protected.
- 3) No building shall be deemed to be protected by a hydrant unless such hydrant is within 15 m of the building.

(II) GENERAL REQUIREMENTS

1. The Contractor at his own cost and charges shall provide all materials, tools, measuring tapes, scaffolding, labour, water and power, necessary for the completion of the whole work, in all respects.
2. The Contractor shall pay fees for testing the material as required by local regulations, if any.
3. The Contractor will arrange from time to time various inspections, permissions and obtains 'the final completion' certificate under the rules of the Chief Fire Officer, Rajasthan Municipal Corporation.

(III) MODE OF MEASUREMENTS

1. All mild steel galvanised pipes shall be measured in linear lengths, Running Meters (RM) along the centre line of the pipe including fittings. The rate on all the cases will be inclusive of all work required for the respective items. All screwed and socketed connections shall include the couplings, flanges, unions, nipples and facilities for disconnections and shall be deemed to be part of the rate quoted. All other items including coupling will be paid for as specified in BOQ, Nos, Sets etc. as the case may be.
2. Pipes of any material (measured over all pipe fittings) shall be given in linear measurement, stating the kind of material, quality of pipe, internal diameter and method of jointing.
3. Cutting and jointing pipes including wastages if any shall be deemed to be included with the items.
4. Suspended pipes : Supports, hangers, 'U' clamps, bolts and nuts, structural cradles, springs and washers including proprietary wall plugs, spacers, erecting all builder's work, fabrication, welding etc. shall be deemed to be included in this item.
5. Concrete beds, benching, haunching, encasing etc. for pipe work shall be measured in cubical contents of the complete works carried as per instructions, stating the mix and size of the concrete and internal diameter of the pipe work covered. Form work shall be deemed to be included with the items. Concrete poured to make good excavation made in excess or requirement shall not be Considered under this item. 'Bedding concrete' for pipe shall be measured as cubical content.
6. All gate valves, ball valves, globe valves, sluice (cut off) valves and similar fittings shall enumerated and each shall be measured separately according to the diameter. The jointing to pipe on either side shall be described.
7. Hose reels and allied equipment shall be enumerated.
8. All testing fees for materials, provision of stoppers, screws and plugs, hoses etc. during progress of pipe work, water for testing, removal and relaying defective work, service charges to be paid to approving authority, initial consumables until take over shall be arranged by the contractor, without extra cost to the owner.
9. The cost of numbering or fixing number and name plates to equipments, landing, cut-off valves, hose boxes, indicator plates etc. shall form part of the over all price quoted against each item in the schedule of quantities and no extra payment will be allowed.
1. All incidental items necessary for proper up-keep, maintenance, disconnections etc. shall be deemed to be part of the item and shall not considered as extra.
2. Companion flanges and flanged pipes of short length required for connecting valves, fixtures, flow switches, control mechanisms and appurtenances as well as flanged joints, disconnecting arrangements shall be deemed to have been included in respective rates quoted.
3. All tools and tackles, welding and heating apparatus, supervision by manufacturer's representative for erection and commissioning of pumps and allied equipment of the system, including performance tests, shall be considered as contingent to the proper workmanship and be deemed to have been covered in the rates for the respective work.

4. Excavation, concrete work, brick work and other building work shall be given in accordance with requirement in the appropriate section thereof and shall be deemed to be included with the items.
- 5.
6. Channels, foot-irons, inspection and access covers with their weight and materials enumerated in the schedule shall be deemed to be included in the cost of respective items.
7. Providing necessary plugs at ends, flushing the system on completion of work and supply of water and testing outfits for works shall be deemed to be included with the respective items of work.
- 8.
9. Rates for any work shall include assembling, cutting, threading, jointing with appropriate materials pinning or building supports, making good damages, all pipe sleeves, cover plates, protective devices from damages, discolouration, testing as specified pipe supports etc. for the stability and functional efficiency of the system including painting the pipes to colour code with primer as specified. Making holes in the walls ceilings in all types of construction work to provide supports for fire fighting services and remaking them including filling replastering, painting them after completion of the work shall be deemed to have been included with the respective items of work.
10. Testing the installation periodically before concealment or back filling of trenches and finally for the take over any tests or facilities demanded by the approving authority or Government, Semi Government Chief Fire Officer, statutory authorities shall be deemed to be the part of the work and arrangements desired or asked shall be made without additional cost to the owner.
11. Necessary assistance, information and follow up in respect of his work shall be given to other agencies such as electrical and plumbing installation contractors in getting approval to their systems by concerned authorities.

LIST OF APPROVED MAKE OR BRANDS

- | | |
|-------------------------------------|---|
| 1. Fire Pump | : <u>Kirloskar</u> /BestandCrompton/Mather and Platt. |
| 2. Electrical Motors | :Kirloskat/ <u>Siemens</u> /NGEF/Crompton |
| 3. Diesel Engine | : <u>Ashok Leyland</u> /Kirloskar/Cummins |
| 4. Main Control Panel | : Custom Built having main Components of
: <u>L & T</u> /EE/siemens. |
| 5. MS Black /GI Pipes | : <u>ZENITH / JINDAL</u> |
| 6. Malleable Iron Fittings | : Crescent/' <u>R</u> ' Brand |
| 7. Sluice Valve (CI) | : <u>Kirloskar</u> /IVC/Kalpana/Sarkar/C&R |
| 8. Non Return Valves (CI) | : <u>Kirloskar</u> /IVC/Kalpana/Sarkar/C&R |
| 9. Landing Valves (CI) | : Minimax/ <u>Newage</u> /SBL |
| 10. Fire Brigade Inlets | : Minimax/ <u>Newage</u> /SBL |
| 11. F.A. Hose Reel (Drum & Bracket) | : Minimax/ <u>Newage</u> /SBL |
| 12. Rubber Hose for above | : <u>Dunlop</u> |
| 13. GM Gate /Globe/Check Valves | : <u>Leader</u> |

14. Flax Canvas Hose : Indian Rayon/Newage
15. CP Hose : Indian Rayon/Newage
16. RRL Hose : Indian Rayon/Newage
17. Hose Couplings Branch Pipe & Nozzle : Minimax/Newage/Indian Rayon (G.M.)
18. Pressure Switches : Danfoss/Switches
19. Pressure Gauge : H. Guru/Fiebig
20. Quartz Bulb Sprinkler Head : Mather & Platt/Ascoa Sprayface
Grinnell/GEM/Viking/HD
21. Alarm Valve and Hydraulic Alarm Motor with GONG : Mather & Platt/Ascoa Sprayface
Grinnell/GEM/Viking/HD
22. PVC insulated and PVC Sheathed Aluminium Conductor Armoured Power Cable of 1.1 kV Grade : ICC/Gloster/Skyton/Necco/
National
23. Flow switch : Potter/System Sensor
24. Water Type (Gas Pressure) Portable Extinguishers : Minimax/Safex/Fires/Surex
Vijay
25. CO₂ Portable and Trolley Mounted Extinguishers : Minimax/Safex/Fires
26. Dry Powder (Cartridge Type) : Minimax/Safex/Fires Extinguishers
Surex/Vijay
27. Portable Foam Type Chemical Portable Extinguishers : Minimax/Safex/Fires
Surex/Vijay
28. Portable ABC-Powder Type :Cease Fire/ Vijay Fire Extinguishers

PART – D
PLUMBING

SCOPE OF WORK

1. GENERAL

- 1.1 The Contractor shall have studied the drawings accompanying the contract and quoted his rate as per item rate.
- 1.2 The rate shall include cost of material, taxes, labour, transport, handling, wastage overheads and profits etc. involved in the plumbing work. No escalation shall be considered during the contract period.
- 1.3 The detailed scope of work is given in Annexure "A". The special specifications or technical specifications shall govern so far as the material and workmanship is concerned.
- 1.4 The clients shall supply some of the materials to the contractor at fixed rate. The material and rate of fixed supply is given in Annexure "B". All other materials required outside the scope of fixed rate supply shall be brought by the contractor from open market.
- 1.5 The drawings which shall be provided from time to time shall strictly be followed. However, the layouts may slightly be changed due to site conditions or decisions during execution without substantial changes in pipe lengths etc. No extras shall be admissible on this account.
- 1.6 If deviations as suggested or approved by owners and consultants are going to lead to extra work, the contractor shall get the confirmation in writing and submit an extra item rate for such work along with proper rate analysis giving cost of material (supported by vouchers) labour, transport and 20% towards profits and overheads. Any oral or written instructions shall be got confirmed.
- 1.7 To obtain 'P' form from concerned authorities of KOTA SMART CITY LIMITED, Rajasthan.
- 1.8 All Municipal approvals and getting the work certified including adequate water supply under 270 A shall be the responsibility of the contractor.
- 1.9 To get all pipes, fittings and other materials tested by KOTA SMART CITY LIMITED, Rajasthan if required testing fees etc., if any shall be borne by the contractor.
- 1.10 All the materials, tools, tackles and scaffolding required to complete the works will be at the contractors' account.

2. ANNEXURE 'A'

- 2.1 This is an item rate tender. The contractor's offer shall be based on scope of work described hereunder, drawings, specifications and conditions of contract as given in this tender document.
- 2.2 Scope of work for plumbing services will be as shown on drawings and as described in the following paragraphs.
- 2.3 Fire fighting installation is not included in the scope of work of the plumber.

3. WATER SUPPLY :

- 3.1 Scope of water supply will include all works involved in connection with the domestic and flushing water supply to the building.
- 3.2 Bringing connection from municipal main, providing, laying and jointing inlet pipe of required dia from municipal main to U/G water tank (fire fighting compartment) along with all excavation, laying and testing of pipe, refilling the trenches, providing water meter with bypass, strainer, all

necessary valves, etc and construction of masonry inspection chamber with C.I. cover and locking arrangement etc., for the meter. All municipal permission for opening the road, making connections etc., will be in the scope of the plumbing contractor except local governing authority charges.

- 3.3 Installation of pumps for lifting water to overhead tank in position in the pump house. (Pumps will be supplied by the clients).
- 3.4 Providing and fixing in position all pipe inserts along with puddle flanges or plates of required diameter and thickness in the R.C.C. walls of pump house. Underground and overhead tanks for inlets, outlets, overflow and drains. Over flow pipes shall be provided with brass wire gauze (mosquito proof). Fixing of inserts at proper locations while concreting of tanks walls is being done by the civil contractor will be the responsibility of the plumbing contractor.
- 3.5 Providing and fixing G.I. welded / screwed pipes within the pump house for suction and delivery upto outside of the pump house. For junctions with C.I. flanged valves. G.I. pipes shall be provided with welded flanges, fixed with nuts, bolts, neoprene, gaskets etc and painting of pipes.
- 3.6 Providing and fixing in position all fitting or specials like tees, bends, tapers etc by welding or flanged joints, including nuts, bolts, neoprene gaskets etc and including painting.
- 3.7 Providing and fixing all valves like foot valves, sluice valves, non return valves (check valves) etc. in the pump house on suction and delivery side and also on rising mains to overhead tanks at tank level near inlets. Valves shall be C.I. double flanged valves for pipes 80 dia and above. For pipes 65 dia and below, valves shall be Gun metal gate valves with screwed ends.
- 3.8 Water supply rising main from pump house upto the overhead tanks including all bends, tees, elbows, unions, reducers etc and fixing it on proper supports both at ground level and vertically against the walls in the shaft on M.S. angle rests supports with U bolts and nuts. Rising main shall be of G.I. welded or screwed.
- 3.9 All water supplies down take pipes for domestic and flushing supply from overhead tank upto the toilet connection in the shafts, horizontal ring main required at the terrace, including 15 dia vent pipes for water outlets extending upto the top of tank, bent downwards and provided with mosquito proof wire gauge. Providing and fixing gate valves at terrace level on main outlets from tanks and on each down take, line in the shafts.
- 3.10 Pipes for overflow and drains from over head tank to be combined and brought upto ground level by vertical down take pipe.
- 3.11 Providing and fixing pressure reducing valves of required diameters on the down take pipes at locations shown on the drawing including bypass arrangements and valves. (Required when the PRV is required to be removed for repairs or replacement).
- 3.12 Fixing down take pipes to M.S. angle supports by U bolts and nuts.
- 3.13 Fixing bucket type strainers at outlets of tank at terrace level.
- 3.14 All manhole covers 600 mm dia of M.S. frame and locking arrangement on underground and overhead tanks. Minimum plate thickness 4 mm.
- 3.15 Testing all G.I. lines to minimum of 15 kg/cm. sq and rectifying leakages if any.
- 3.16 All pipes shall be 'C' class G.I. all fittings shall have ISI mark.
- 3.17 All G.I. pipes exposed on terrace shafts and inside toilets will be painted with one coat of approved anti corrosive paint and two coats of approved enamel paint.

- 3.18 All G.I. pipes embedded in walls or under floors or below ground level shall be painted with black Japan paint and then wrapped with hesian cloth impregnated in bitumen before covering with earth or mortar.
- 3.19 Cost of all water supply installation described in 3.1 to 3.18 shall be included in the lumpsum offer for plumbing of toilets.

4. **SANITARY DRAINAGE :**

Scope of sanitary drainage will include all piping involved in taking the waste water and sewage through vertical stacks and for anti-syphonage in the plumbing shafts upto the inspection chamber at ground level and shall consist of the following :

- 4.1 Providing, laying and jointing vertical waste stacks of 75 dia with all fittings like single or double wyes, bends, cowls, plugs, bends, offsets etc. with or without access doors.
- 4.2 Providing, laying and jointing vertical soil stacks 100 dia along with all fittings as per 4.1
- 4.3 Providing, laying and jointing 75 dia vent pipe including all fittings as per 4.1.
- 4.4 Fixing soil, waste and vent stacks vertically against walls of the shaft with P.V.C. or M.S. brackets to keep the stacks away from the wall. All joints, P.V.C., Soil, waste and vent pipes shall be made with rubber seals in the sockets and the plain end inserted with jointing lubricant as per manufacturers' specifications.
- 4.5 Providing good masonry support to all the vertical stacks at the foot of the bend at ground level.
- 4.6 Installing 150x100 stone ware gully trap at the foot of the waste stacks in P.C.C. construction of brick masonry 115 mm thick wall around it. Making a hopper over the trap and plastering the brick work and providing C.I. frame and cover, weighing not less than 4 kgs.
- 4.7 All pipes and fittings used for stacks should be P.V.C. S.W.R. pipes "Supreme" or "Prince" or other approved make (as given list of approved makes).
- 4.8 Cost of all drainage work under 4.1 to 4.7 shall be included in the lumpsum offer per toilet.
- 4.9 The sewage and waste water collected at the ground level and discharged in the inspection chamber shall be conveyed to the municipal sewer and will involve the following:
- 4.9 a. Construction of brick masonry inspection chambers complete as per standard KOTA SMART CITY LIMITED, Rajasthan drawings and specifications from depths 0.6 m - 1.5 m including all excavation, refilling etc.
- 4.9 b. Construction of brick masonry conical manhole 1.2 m dia complete as per standard KOTA SMART CITY LIMITED, Rajasthan drawing and specification for depths exceeding 1.5 m including all excavation, refilling etc.
- 4.9 c. Providing, laying and jointing 150 mm and 230 mm dia salt glazed stoneware pipes in position including bedding, haunching or encasing in A.C.C. as required as per KOTA SMART CITY LIMITED, Rajasthan practice and including all excavation refilling etc. complete.
- 4.9 d Providing, laying and jointing with lead 150 mm dia cast iron LA class pipes in position for sewer within the building and supporting the sewer to the soffit of podium slab by means of M.S. angle hangers held by M.S. rods, nuts and bolts fixed to the slab by dash fasteners.
- 4.9 e Providing rubber bellow connection between drainage pipes at the joint of main structure and podium structure.

- 4.9 f The scope of the contractor will also include the diversion of soil and waste pipes from upper floors combining the flows at stilt floor level in a horizontal header from two or more toilets and bringing the pipes to podium level to discharge into inspection chambers.
- 4.9 g The inspection chambers within the building will have their top at podium level and will be resting on Masonry pedestals or platforms constructed within the basements upto the bottom of the P.C.C. of the inspection chamber. The construction of the platforms will not be in the scope of the contractor.
- 4.9 h Providing venting for the head manhole and last manhole.
- 4.9 i Providing and installing sewer trap in the last manhole.
- 4.9 j Making connections to municipal sewer including all necessary permissions from concerned authorities of KOTA SMART CITY LIMITED, Rajasthan.
- 4.9 k Cost of all drainage work under 4.9 shall be quoted separately as a lumpsum in the BOQ.

5. STORM WATER DRAINAGE :

- 5.1 Providing lead flashing inlets at terrace levels for rain water down take pipes including the inlet and fixing dome shaped grating on the inlet.
- 5.2 Providing laying and jointing P.V.C. vertical pipes against wall from terrace level upto ground including all fittings and fixing as per 4.4 including making drainage inlets for storm water at refuge floors.
- 5.3 The contractor's scope will also include the drainage which includes construction of open storm water drain in the plot for collection of rain water and discharging the same to the municipal storm drain outside the plot. The layout and cross section of this drain will be shown on the drawing.
- 5.4 Construction of storm water channel in the basement in P.C.C. and covered with C.I. grating leading to the storm water sump in the basement for any water reaching the basement.
- 5.5 Supply and installation of sump pump together with delivery pipe connected to the outside municipal drain.
- 5.6 Supply, fixing of necessary electrical panel for automatic starting and stopping of pumps at present high and low levels in the sump.
- 5.7 The cost of storm drainage work listed under items 5.1 to 5.2 shall be included in the lumpsum offer per toilet.
- 5.8 The cost of storm drainage listed under 5.3 to 5.6 shall be quoted separately as lumpsum for area storm drainage.

6. INTERNAL PLUMBING :

Scope of internal plumbing will include all work within the toilets including kitchens and will consist of the following:

- 6.1 Providing and fixing in position all water supply (C.P. fittings) and sanitary fittings along with all accessories.
- 6.2 All water supply piping of different sizes within the toilets starting from water connection from the supply downtake pipes in the shaft upto the fixture including all fittings and laying the pipes in position.
- 6.3

- a) Making chases in the wall and protecting the concealed pipes against corrosion by painting them with one coat of bituminous paint and enwrapping the pipes with hesian cloth soaked in bitumen, (only for G.I. pipes) redoing the wall surfaces etc after installation of pipes and fixing them with M.S. Clamps.
 - b) Making chases in the wall and redoing the wall surfaces etc after installation of pipe and fixing them with M.S. clamps for copper pipes.
 - c) For pipes carrying hot water from the geyser, these pipes will be treated as (a) or (b) above for concealed G.I. or copper pipes as the case may be; but the pipes will be wrapped with asbestos or magnesium tape or glass wool before enwrapping with hesian cloth for G.I. pipes and before installation in chases for copper pipes.
- 6.4 Providing and fixing all stop cocks, angle stop cocks, concealed type C.I. connections bib taps & pillar taps, C.P. Wall flanges, shower roses, sink cocks etc. of approved make.
 - 6.5 Providing and fixing in position all sanitary fittings of approved make and specified catalogue no. in position including G.I. or lead or P.V.C. waste pipes, C.P. bottle traps, 'P' traps, extension pieces and wall flanges etc.
 - 6.6 Providing, laying and jointing P.V.C. pipes for soil, waste and vent including straight pipes, bends, wyes, tees, etc, with or without access door from sanitary fittings or Nahani traps upto their connections to the vertical soil or waste stack including laying them to proper alignment and gradient and supporting it to the slab above with Aluminium hangers / P.V.C. clamps/ M.S. brackets.
 - 6.7 The support will be by means of Aluminium flat hangers with slotted holes. The hangers shall be fixed to the bottom of toilet slab and the pipe will be held against the hanger by U-bolts and nuts. Position of 'U' nuts will vary to provide required gradient to pipes.
 - 6.8 Providing and fixing 40 mm dia P.V.C. vent from W.C. vent horn to the outside vent stack.
 - 6.9 Providing and fixing C.P. brass flush valves and C.P. flush pipes for water closets.
 - 6.10 Master stop cock at each toilet inlet shall be located inside the toilet at suitable location.
 - 6.11 The piping layout in the walls shall be done to suit architects tiling pattern at site.
 - 6.12 Providing and fixing water purifier / aqua guard near the kitchen sink.
 - 6.13 Providing and installation of boilers in kitchen with necessary piping.
 - 6.14 Providing and fixing Aqua guard / water purifiers along with necessary water connection
 - 6.15 Cost of all items of work under 6.1 to 6.14 will be included in the lumpsum cost per toilet.

7. MISCELLANEOUS :

- 7.1 Wherever pipes are laid below G.L. necessary excavation, refilling, consolidation and removal of excess material shall be considered.
- 7.2 Wherever pipes are supported against wall they shall be firmly fixed on teak wood spacers or M.S. Spacers with U bolts so as to keep them away from the wall.
- 7.3 No painting shall be considered for P.V.C. pipes which shall be in their natural colour.
- 7.4 Water supply pipes are to be hydraulically tested to 2 times the working pressure before embedding in walls or ground.
- 7.5 The makes of materials shall be that which has been used for sample flat of tower.
- 7.6 After all C.P. fittings and sanitary ware is approved; one piece of approved fittings and fixtures shall be kept in the office of the clients till completion of work.
- 8 The scope of contract is to furnish all labour materials, transport equipment necessary to

provide and installation complete in full working order including all that is reasonably considered as proper construction. The Contractor's scope is to :

- a) To convey water from the municipal main to the underground tank, pump it into overhead tank and distribute the same to various faucets by a gravity distribution system.
- b) To convey water borne wastes safely to municipal sewer by a system of drain pipes, vertical stacks and sewers at ground level.
- c) To collect and convey storm water from terrace and open areas around to the municipal storm drain.

Hence even though the scope of work is given in as many details as possible in this document and drawings, the contractor shall be deemed to have considered all such requirements for making the system complete and function smoothly and satisfactorily. The offer shall be considered to have accounted for all such requirements. Any inadvertent omission on the drawings and specification will not be considered an excuse for extra payment.

TECHNICAL SPECIFICATIONS

If the I.S. referred to in the specifications is revised after the year mentioned, the latest revision shall be considered.

1.1.A G.I. Pipes and Sockets :

1.1.1 Materials :

The pipes shall be galvanized mild steel welded and seamless screwed and socketed tubes conforming to the requirement of I.S. 1239-1982 for the specified grade (light, medium and heavy). They shall be of the diameter (Nominal bore) specified in the description of the items.

The pipes and sockets shall be clean finished, well galvanized in and out and free from cracks, surface flaws, laminations, and other defects. All screw threads shall be clean and well cut. The ends shall be cut clean and square with the axis of the tube. Unless otherwise specified, the pipes below G.L. or concealed in walls or floors shall be "C" class and those supported on wall shall be of "B" class.

All screwed tubes and sockets shall have pipe threads conforming to the requirement of IS: 544: 1975. Tubes shall be screwed with taper threads while the sockets with parallel threads.

The weights of G.I. pipes with plain ends, in Kg. / meter for various classes and diameter are reproduced below for ready references:

Dia	(Light) "A" Class (Yellow Band)	(Medium) "B" Class (Blue Band)	(Heavy) "C" Class (Red Band)
15	0.952	1.22	1.45
20	1.41	1.58	1.90
25	2.01	2.44	2.97

32	2.58	3.14	3.84
40	3.25	3.61	4.43
50	4.11	5.10	6.17
65	5.80	6.51	7.90

1.1.2 Pipe Fittings:

The fittings shall be of seamless wrought steel or mild steel tubulars complying with all the appropriate requirements given in para 1.1.1 or as specified. The fittings shall be designated by the respective nominal bores of the pipes for which they are intended. Fittings used for concealed work shall be of M.S. only.

The fittings shall have screw threads at the ends conforming to the requirement of IS : 544 -1975. Female threads on fittings shall be parallel and male threads (except on running nipples and collars of unions) shall be taper.

1.1.3 Cutting, laying and jointing:

The pipes and fittings shall be inspected at site before use to ascertain that they conform to the specification given in para 1.1.1 above. The defective pipes shall be rejected. Where the pipes have to cut or rethreaded, the ends shall be carefully filed out so that no obstruction to bore is offered. The end of the pipes shall then be threaded conforming to the requirements of IS : 544 -1975 with pipe dies and taps carefully in such a manner as will not result in slackness of joints when two pieces are screwed together, the taps and dies shall be used only for straightening screw threads which have become bent or damaged and shall not be used for turning of the threads so as to make them slack, as the later procedure may not result in a water tight joint. The screw threads of pipes and fittings shall be protected from damage until they are fitted.

The pipes shall be cleaned and cleared of all foreign matter before being laid. In jointing the pipes, the inside of the socket and the screwed end of the pipes shall be oiled and rubbed over with white lead and a few turns of Teflon tape or spun yarn wrapped round the screwed end of the pipe. The end shall then be screwed in the socket, Tee etc. with the pipe wrench. Care should be taken that all pipes and fittings are properly jointed so as to make the joints completely water tight and pipes are kept at all times free from dust and dirt during the fixing. Burrs from the joint shall be removed after screwing. After laying, the open ends of the pipes shall be temporarily plugged to prevent access of water, soil or any other foreign matter. Any threads exposed after jointing shall be painted or in the case of underground piping thickly coated with approved anticorrosive paint to prevent corrosion.

1.1.4 Internal Work:

Internal work means all water supply pipes laid within the building and will include internal pipes within toilets, baths, kitchens, vertical pipes within the shafts, section of water supply riser to overhead tank from the pump house within the building, pipes laid

on terrace for ring mains from overhead tank etc.

For internal work the galvanised iron pipes and fittings shall run outside the surface of the walls or ceiling (not in chase) unless otherwise specified. The fixing shall be done by means of G.I. or M.S. clamps fixed to wooden bats fixed over walls, keeping the pipes about 1.5 cm clear of the wall. When it is found necessary to conceal the pipes chasing may be adopted or pipes fixed in the ducts or recesses etc. provided there is sufficient space to work on the pipes with the usual tools. The pipes shall not ordinarily be buried in walls or solid floors. Where unavoidable pipes may be buried for short distances provided adequate protection is given against damage and where so required joints are not buried. Where directed by the Engineer-in-charge, a M.S. tube sleeve of higher diameter shall be fixed at a place, a pipe is passing through a wall or floor for reception of the pipe and to allow freedom for expansion and contraction and other movements. In case the pipe is embedded in the walls or floors, it should be painted with anti corrosive bituminastic paint of approved quality and the pipe shall be wrapped in burlap or hesian cloth impregnated with butumen. The wrapping shall be made to fit tightly over the pipe and while wrapping with a new piece it shall overload the old one and the joint shall be tied with M.S. wire or nylon thread. Where pipes are encased within, the chases made in the wall they shall be fixed to the wall with M.S. clamps so as to prevent movement before filling in and making good the chase. The pipe should not come in contact with lime mortar or lime concrete as the pipe is affected by lime. Under the floors, the pipes shall be laid in layer of sand filling around the pipe provided below floor level.

1.1.4.1 Insulation for hot water pipes:

Pipes carrying hot water from storage heater or from central heating system shall be insulated for preventing loss of heat. The materials used for insulation shall be hair felt, asbestos fibre, mineral wool, glass wool or glass wool felt. Insulation material of specified thickness shall be wrapped around the pipe tightly and tied in position by wire loops at certain intervals.

This shall be covered by hesian cloth wrapping as detailed above for concealed cold water pipes. All pipes and fittings shall be fixed truly vertical and horizontal unless unavoidable. The pipes shall be fixed to the walls with standard pattern holder bat clamps of required shape and size so as to fit tightly on the pipes when tightened with screwed bolts. The bats shall be of teakwood painted with coal tar or anti-termite paint.

These clamps shall be embedded in brick work in cement mortar 1:3 (1 cement : 3 coarse sand) and shall be spaced at regular intervals in straight lengths as shown in the table given below.

Size of the Pipe mm	Lengths	
	Horizontal Runs Meters	Vertical Runs Meters
15	2	2.5

20	.....	2.5	3
25	.....	2.5	3
32	.....	2.5	3
40	.....	3	3.5
50	.....	3	3.5
65	.....	3.5	5
80	.....	3.5	5

The clamps shall be fixed at lengths shorter than above near the fittings or as directed by the Engineer in charge.

For G.I. pipes 15 mm to 25 mm diameter the holes in the walls and floors shall be made by drilling with chisel or jumper and not by dismantling the brick work or concrete. However, for bigger dimension pipes the holes shall be carefully made of the smallest size as directed by the Engineer-in-charge. After fixing the pipes the holes shall be made good with cement mortar 1:3 (1 cement : 3 coarse sand) and properly finished to match the adjacent surface.

1.1.5

External work:

External work will include all water supply piping from pump house to the building or distribution network from a central overhead tank upto the building either directly or through an individual overhead tank. It will also include suction and delivering piping within the pump house. The galvanized iron pipes and fittings shall be laid in trenches. The widths and depths of the trenches for different diameters of the pipes shall be provided as given in the table below, and shall be deep enough to have a clear cover of at least 400 mm above the top of pipes.

Dia of pipe	Width of trench	Depth of trench
15 mm to 50 mm	30 cms	60 cms
60 mm to 100 mm	45 cms	75 cms.

At joints the trench shall be widened where necessary the work of excavation and refilling shall be done true to line and gradient.

The pipes shall be painted with two coats of anticorrosive bitumastic paint of approved quality. The pipes shall be laid on a layer of 7.5 cms sand and filled upto 15 cms above the pipes. The remaining portion of the trench shall than be filled with excavated earth. The surplus earth shall be disposed off as directed. Alternatively the pipes shall be protected by wrapping hesain cloth soaked in bitumen.

When excavation is done in rock the bottom shall be cut deep enough to permit the pipes to be laid on a 7.5 cm thick cushion of sand. In case of bigger diameter pipes where the pressure is very high thrust block of cement concrete 1:2:4 (1 Cement: 2 coarse sand: 4 graded stone aggregate of 20 mm normal size) shall be constructed at all bends in any plane to transmit the hydraulic thrust without impairing the ground and spreading it over a sufficient area, as directed by the engineer.

1.1.6 **Testing the Joints:**

After laying and jointing, the pipes and fitting shall be inspected under working conditions of pressure and flow. Any joint found leaking shall be redone and all leaking pipes removed and replaced without extra cost.

The following procedure shall be adopted for testing of pipes. No work shall be covered until it has been tested and found OK by the engineer in charge.

The pipes and fittings after they laid shall be tested to hydraulic pressure of 6 Kg/sq.cm. (60 meter or double the designed working pressure whichever ever is more) The pipes shall be slowly and carefully charged with water allowing all air to escape and avoiding all shock or water hammer. The draw off points shall be plugged and stop cocks shall be applied gradually. Pressure gauge must be accurate and preferably should have been stopped; the test pressure should be maintained without loss for at least half an hour. The pipes and fittings shall be tested in sections as the work of laying proceeds, keeping the joints exposed for inspection during the testing.

1.1.7 **Measurements:**

the lengths shall be measured in running meter correct to a cm for the finished work, which shall include G.I. pipe and G.I. fittings such as bends, tees, elbows, reducers, crosses, plugs, sockets, nipples, unions and nuts, but exclude brass or gun metal taps (cocks) valves, lead connection pipes and shower rose. The measurements shall be taken separately for internal and external work. For this the internal and external work shall have meaning as given in 1.1.4 and 1.1.5. The length shall be taken along the central line of the pipe fittings. All pipes and fittings shall be classified according to their diameters, method of jointing and fixing substance, quality and finish. The diameter shall be the nominal diameter of the internal bore. The length of pipe measured shall be considered as inclusive of all cuttings and wastage. In case of fittings of unequal bore, the largest bore shall be measured. Lengths shall be inclusive of all fittings as specified above upto 50 mm dia. For pipes over 50 mm dia the fittings shall be enumerated and paid separately under different item.

Digging and refilling of trenches shall be measured separately or clubbed with main item. Pipes laid in trenches (or without supports) and pipes fixed to walls, ceilings, etc, with supports shall be measured separately. If digging and refilling is clubbed with the item, the maximum depth of trench shall be specified.

1.1.8 **Rate:**

1.1.8.1 **Internal work:**

The rate for internal work shall include the cost of labour and material involved in all the operations described above except in para 1.1.5 and shall be inclusive of fitting upto 50

mm dia. The rate shall include the cost of cutting holes in walls and floors and making good the same. This shall not however include concealed pipe work in which case cuttings of chase enwrapping with hesain cloth and making good shall be paid separately. It shall not include painting of pipes and providing sleeves unless specified otherwise for which separate payment shall be made. Insulation of pipes for hot water supply will be paid separately as extra over for insulation, chasing of walls and concealed etc in the bills of quantities.

1.1.8.2 External work:

The rate for external work shall include the cost of labour and materials involved in all the operations described above except in para 1.1.4. The rate shall include excavation of trenches, painting of pipes and sand filling all round the pipes, unless specified otherwise.

1.1.8.3 The work involved under the particular item shall be completely described in the bill of quantities.

1.2 Making connection of G.I. Distribution Branch with G.I. Main:

1.2.1 Materials – Pipes and Fittings – Para 1.1.1 and 1.1.2 shall apply.

1.2.2 Preliminary work – A pit of suitable dimensions shall be dug at the point where the connection is to be made with the main and earth removed upto 15cm below the main.

The flow of water in the water main shall also be disconnected by closing in sluice or wheel valves on the mains.

1.2.3 Making connection – For cutting and jointing para 1.1.3 shall apply. The G.I. main shall first be cut. Water, if any collected in the pit shall be bailed out and ends of the G.I. pipe threaded. The connection of distribution pipe shall then be made by fixing malleable G.I. Tee of the required size and fittings such as Jam nut, G.I. socket, connecting piece etc.

1.2.4 Testing of Joints – Para 1.1.6 shall apply.

1.2.5 The portion of the pipe in the pit shall be painted with bitumastic paint and encased with sand 15 cm all round. The pit shall be filled with earth in level with the original ground surface watered, rammed and the area dressed.

1.2.6 Measurements – The work for making connections should be counted in numbers.

1.2.7 Rate – The rate shall be per no. of connection of specified size and shall include the cost of labour and materials involved in all the operations described above.

1.3 Fixing water meter and stop cock in G.I. pipe line :

1.3.1 Materials – Pipe and fittings Para 1.1.2 shall apply. Water meter shall conform to IS 779-1968.

1.3.2 Cutting G.I. Pipe Line : The G.I. Pipe line shall be cut to the required length at the position where the metre and stop cock are required to be fixed. The ends of the pipe shall then be threaded. For cutting and threading the pipe para 1.1.3 shall apply.

Fixing meter and stop cock : The meter and stop cock shall be fixed in position by

means of connecting pipes, G.I. Jam nut and socket etc. The stop cock shall be fixed near the inlet of the water meter. The paper disc inserted in the ripples of the meter shall be removed and the meter installed exactly horizontal or vertical in the flow line in the direction shown by the arrow cast on the body of the meter. Care shall be taken that the factory seal of the meter is not disturbed. Wherever the meter shall be fixed to a newly fitted pipe line, the pipe line shall have to be completely washed before the fitting the meter. For this purpose a piece of pipe equal to the length of the meter shall be fitted in the proposed position of the meter in the new pipe line. The water shall be allowed to flow completely to wash the pipe line and then the meter installed as described above by replacing the connecting piece.

1.3.3 Testing of Joints : Testing of joints shall be done as described in para 1.1.6

Measurements : The work of fixing meters and stop cocks shall be counted in numbers separately according to the rate. The rate shall be per no and will include, the cost of labour and materials involved in all the operations described above excluding the cost of stop cock and water meter.

1.1.B FlowGuard™ CPVC PLUMBING SYSTEM SPECIFICATION

Concealed Plumbing :

“ All internal concealed plumbing for water supply shall be done with **FlowGuard™ CPVC** brand from Noveon Inc. The **FlowGuard™** pipes & fittings shall conform to CTS (Copper Tube Size) SDR-11 as per ASTM D2846. All pipes and fittings from ½” upto 2” shall come under this category thereby meeting a pressure rating of 400 psi (28kg/sqcm) at 23°C and a pressure rating of 100 psi (7kg/sqcm) at 82°C.

External Plumbing :

“ All external plumbing for water supply and distribution shall be done with **FlowGuard™ / Corzan™ CPVC brand from Noveon**. The CPVC pipes above 2” for external water supply lines shall conform to ASTM F441 CPVC Schedule 40 & 80 pipe and will be the **Corzan™ CPVC** brand. The fittings above 2” size shall conform to ASTM F438 (Schedule 40 CPVC fittings) or ASTM F 439 (Schedule 80 CPVC fittings). All threaded CPVC fittings shall conform to ASTM F437 (threaded CPVC fittings schedule). A heavy bodied CPVC solvent cement shall be used along with a primer conforming to ASTM F493 shall be used for all pipes and fittings upwards of 2” in diameter. All external **FlowGuard™ / Corzan™** CPVC pipes shall be coated with a water based acrylic paint emulsion for enhanced UV protection.

Pressure Rating :

Pressure rating applies for water at 23°C and for unthreaded pipe only. For temperatures greater than 23°C derating factors have to be used as per the table given below :

Temperature Derating Factors	
Working Temperature	Pipe Derating Factor

°F	°C	
73 – 80	23 – 27	1.00
90	32	0.91
100	38	0.82
120	49	0.65
140	60	0.50
160	71	0.40
180	82	0.25
200	93	0.20

CPVC Solvent Cement Specifications :

“ The CPVC solvent cement used for installing **FlowGuard™** and **Corzan™** CPVC piping systems shall conform to ASTM F493. For FlowGuard™ pipes from ½” upto 2” pipes and fittings, a single step medium bodied CPVC solvent cement should be used. For Corzan™ CPVC pipes and fittings upwards of 2”, a primer shall be used followed by a heavy bodied solvent cement conforming to ASTM F493. PVC solvent cement should not be used.

JOINING FlowGuard™ CPVC PIPES & FITTINGS :

Cutting : FlowGuard™ pipes can be easily cut with a wheel – type plastic tubing cutter, a hack saw or ratchet cutters. Cutting the pipe as squarely as possible provides optimal bonding area within the joint. If any indication of damage or cracking is evident at the pipe end, cut off at least 2 inches (5 cms) beyond any visible crack.

Deburring / Beveling : A chamfering tool or a circular file are suitable for deburring the ends of the pipe. A slight bevel at the end of the tubing will ease entry of the pipe into the fitting socket and minimize the chances of pushing solvent cement to the bottom of the joint. Wipe any loose direct, plastic burrs before doing a dry fit of the pipe and fitting prior to solvent cement application.

Solvent Cement Application / Assembly : A heavy even coat of solvent cement is to be applied on the pipe followed by a thin coat inside the fitting socket. Immediately insert the pipe into the fitting socket, rotating the pipe ¼ to ½ turn while inserting. This motion ensures an even distribution of cement within the joining. Hold the assembly for approximately 10 seconds for the joint to set – up. An even bead of cement should be evident around the joint as a visual check to ensuring proper application of the solvent cement.

Testing :

The system should be hydrostatically pressure tested at 10 bar pressure for one hour. When pressure testing, the system should be filled with water and all air bled from the highest and farthest points in the run. If a leak is found, the joint must be cut out and discarded. Air testing is not recommended.

Horizontal & Vertical Support:

“ A typical Hot & Cold Water distribution system operating at 60 - 70°C requires support for horizontal lines every 90 cm for diameters of 32 mm and below and every 120 cm on larger sizes. However the following spacings are based on conservative engineering assumptions and can be used at water temperatures indicated as below:

Water (max) temperature	20°C (70°F)		50°C (120°F)		70°C (160°F)		80°C (180°F)	
	Feet	Metre	Feet	Metre	Feet	Metre	Feet	Metre
1/2"	5.5	1.7	4.5	1.4	3.0	0.9	2.5	0.8
3/4"	5.5	1.7	5.0	1.5	3.0	0.9	2.5	0.8
1"	6.0	1.8	5.5	1.7	3.5	1.1	3.0	0.9
1 1/4"	6.5	2.0	6.0	1.8	3.5	1.1	3.0	0.9
1 1/2"	7.0	2.1	6.0	2.0	3.5	1.1	3.5	1.1
2"	7.0	2.1	6.5	2.0	4.0	1.2	3.5	1.1
2 1/2"	8.0	2.4	7.5	2.3	6.5	2.0	4.0	1.2
3"	8.0	2.4	8.0	2.4	7.0	2.1	4.0	1.2
4"	9.0	2.7	9.0	2.7	7.5	2.3	4.5	1.4
6"	10.0	3.0	9.5	2.9	8.0	2.4	5.0	1.5

Vertical piping should be supported at each floor and should have a mid-storey guide, unless thermal expansion design calls for other provisions. **Piping should NOT be anchored tightly by the supports** but secured in a manner to allow for a degree of movement caused by thermal expansion.

Thermal Expansion :

Allowances must be made for expansion and contraction for CPVC piping due to heating and cooling of water. For horizontal runs, the pipe must be hung with smooth straps which will not restrict the movement. Thermal expansion can be accommodated with changes in direction; however, a long straight run may require an offset or loop.

Water Heater Hook – Ups :

When connecting to a gas or electric water heater, FlowGuard™ CPVC pipes should not be located within 1 1/2' or 50 cms of the flue. A metal nipple or flexible appliance connector should be used. When FlowGuard™ CPVC is piped directly to the water heater tapping, a CPVC to brass transition fitting (

union type) should be used. Teflon is recommended as the thread sealant for transition connection between CPVC to metals and other threaded plastic pipe systems.

1.4 Water Supply Fittings :

1.4.1 Gate, Globe and Check Valves :

General – The brass or gun metal fittings shall be heavy quality and of approved manufacture and pattern with screwed or flanged ends as specified. The fittings shall in all respects comply with the Indian Standard specifications No. IS 778 – 1971. The standard size of brass or gun metal fittings shall be designated by the nominal bore of the pipe outlet to which the fittings are attached. A sample of each kind of fittings shall be got approved from the Engineer- in-charge and all supplies made according to the approved samples.

1.4.2 All cast fittings shall be sound and free from laps, blow holes and fittings both on internal and external surfaces shall be clean, smooth and free from sand etc. Burning, plugging, stopping or patching of the casting shall not be permissible. The bodies, bonnets, spindles and other parts shall be truly machined so that when assembled the parts shall be axial, parallel and cylindrical with surfaces smoothly finished. The area of the water way of the fittings shall not be less than the area of the nominal bore.

The fittings shall be fully examined and cleared of all foreign matter before being fixed. The fittings shall be fitted in the line in a workman like manner. The joints between fittings and pipes shall be made leak proof. The joints and fittings shall be leak-proof when tested to a pressure of 6 kg/sq.cm. as described in para 1.1.6 and the defective fittings and joints shall be replaced or redone, without any extra cost.

1.4.3 Brass bib cock and stop cock :

A bib cock (bib tap) is a draw off tap with a horizontal inlet and free outlet and a stop cock (stop tap) is a valve with a suitable means of connections for insertion in a pipe line for controlling or stopping the flow. They shall be of specified size and shall be of screw down type and shall conform to IS 781-1967. The closing device should work by means of a disc carrying a renewable non-metallic washer which shuts against water pressure on a seating at right angles to the axis of the threaded spindle which operates it. The handle shall be either crutch or butterfly type securely fixed to the spindle. Valve shall be of the loose leather seated pattern. The cocks (taps) shall open in anticlockwise direction.

The bib cock and stop cock shall be polished bright. The minimum finished weights of bib tap (cock) and stop tap (cock) as given in the I.S. Specifications are reproduced below:

Size	Lengths	
	Minimum finished Weight	
Mm	Bib Tap	Stop Tap

	Kg	
8	0.25	0.25
10	0.30	0.35
15	0.40	0.40
20	0.75	0.75

When the bib cocks or stops cocks are required to be chromium plated, the chromium plating shall be grade B type conforming to IS 1068 –1958. The chromium shall never be deposited on brass unless a heavy coating of nickel is interposed. In case these are required to be nickel plated, the plating shall be of the first quality with a good thick deposit of silvery whiteness capable of taking high polish which will not easily tarnish or scale. In finish and appearance, the plated articles, when inspected shall be free from plating defect such as blisters, pits roughness and unplated areas and shall not be stained or discoloured. Before a plate is plated, the washer plate shall be removed from the fittings. The gland packing shall be protected from the plating solution. Where a fanny head is prescribed the bib tap or stop tap shall be of approved make and should preferably have an I.S.I. mark. For concealed piping, concealed variety of stop cocks shall be used.

1.4.4 Gun metal bib cock and stop cock :

These shall be of gun metal screw down pattern of the size as specified. So far as the general requirements of material are concerned, these shall be similar to those as described in para 1.4.2. The weight of these shall be the same as for brass bib cocks and stop cocks as described in para 1.4.2.

1.4.5 Brass full way valve :

Full way valve is a valve with suitable means of connection for insertion in a pipe line for controlling or stopping the flow. The valve shall be of brass fitted with a cast iron wheel and shall be of gate valve type opening full way of the size as specified. The valve shall be of best quality and of approved make and shall have the following approximate weights with a tolerance of 5 percent.

Mm	Flanged ends Kg	Screwed Ends Kg
15	1.021 (Provisional)	0.567 (Provisional)
20	1.503 “	0.680 “
25	2.495 “	1.077 “
32	3.232 “	1.599 “

40	4.082	“	2.268	“
50	6.691	“	3.232	“
65	10.149	“	6.804	“
80	13.381	“	8.845	“

1.4.6 Gun metal full way vale with wheel:

These shall be of the gun metal fitted with wheel and shall be of gate valve type opening full way and of the size as specified. These shall generally conform to I.S. 778-1971 and their approximate weights shall be as given in para 1.4.5.

1.4.7 Ball Valve:

The ball valve shall be of high pressure or low pressure class and shall be of sizes as specified.

The nominal size of the ball valve shall be that corresponding to the size of the pipe to which it is fixed. The ball valve shall be of brass or gun metal as specified and the float of copper sheet. The minimum thickness of copper sheet used for making the float shall be 0.45 mm for float upto 115 mm dia and 0.58 mm for float exceeding 115 mm dia. The float shall be spherical in shape. The jointing of the float shall be made by efficiently burnished, lapped and soldered seam or by brazing. Polythene floats (IS 3395-1965) may be used if specified. The body of the high pressure ball valve when assembled in working conditions with the float immersed to not more than half of its volume shall remain closed against a test pressure of 10.5 kg/sq.cm. and low pressure valve against a test pressure of 3.5 kg/sq.mm.

The ball valve shall generally conform to I.S. Specification No. 1703:1977. The weight of ball cock and the size of the ball be as per the table given below.

Both low pressure and high pressure ball valves are designed for the use on mains having pressures of 17.5 kg/sq.mm.

Weights of different dia of ball vales with copper floats are given below:

Dia		Total Weight	
		H.P. Gms	L.P. gms
15	-	524	481
20	-	986	867
25	-	1549	1411
32	-	2120	1873

40	-	2646	2303
50	-	4454	3959

1.5 Sluice Valves and other appurtenances :

1.5.1 Sluice Valves :

The sluice valves are used in a pipe line for controlling or stopping flow of water. These shall be of specified size and class and shall be of inside non raising screw type spindle with either double flange or double socket ends and cap or hand-wheel.

These shall in all respects comply with the Indian Standard Specifications I.S. 780-1984 for valves upto and including 300 mm size and No. 2906-1969 for valves 350 mm and above size. Class I sluice valves are used for maximum working pressure of 10 kg/sq.cm (100 meter Head) and class II sluice valves for 15 kg/sq.cm (150 meter head).

The body, domes, covers, wedge gate and stuffing box shall be of good quality grey cast iron, the spindle of high tensile brass, the nut and valve seats of leaded tin bronze. The bodies, spindles and other parts shall be truly machined with surfaces smoothly finished. The area of the water way of the fittings shall be not less than the area equal to nominal bore of the pipe.

The valve wheel shall be marked with an arrow to show the direction of turn for closing of the valve.

The valve shall be fully examined and cleared of all foreign matter before being fixed. The fixing of the valve shall be done by means of bolts, nuts and 3 mm rubber gasket or chemically treated compressed fibre board 1.5 mm minimum thickness and of weight less than 0.183 gm per sq.cm. with the flanges of spigot and the socketed tail pieces drilled to the same specification in the case of S&S pipes and with flanges in case of flanged pipes. The tail pieces shall conform to I.S. 1538-Part VII-1976. These shall be jointed to the pipe line by means of lead chaulked joints.

1.5.2 Appurtenances :

The other appurtenances of pipe line are mentioned below :

- i. **Air Valves :**
These are placed at every summit in the pipe line to permit the escape of air when the main is filled and afterwards if any air is carried into the mains. These are also placed on long stretches of nearly level main. The diameter of air valve shall be 1/8th the diameter of the main.
- ii. **Scour valve :**
These are gate valves placed at the bottom of all depressions or valley points for emptying the main or letting out the sediment.
- iii. **Reflux valves or Non Return valves :**
These are fixed so as to open in the direction of flow but automatically close

if the water flows back. They are used to diminish the damage done by the escape of water due to a burst or prevent damage to impellers of pump.

- iv. Pressure reducing valves :
These are fixed at the down stream ends of long lengths of main so as to reduce from excessive pressure to the normal whenever it occurs, like in water downtake pipes of high rise building.
- v. Foot valves :
These are provided on the suction side of pumps with negative suction. They open only in one direction due to suction pressure but close due to weight of water column and prevent water in pump impeller and suction pipe to flow back into the tank.

1.5.3 Measurements:

The valves, and tail pieces shall be enumerated separately unless otherwise specified, under relevant items.

1.5.4 Rate:

The rate shall include the cost of material and labour involved in all the operations described above against relevant items of work which will include also the cost of nuts, bolts, gasket etc.

1.6 Masonry Chambers:

- 1.6.1 All masonry chambers for sluice valves, meters etc. shall be built as per typical drawings supplied along with specifications. Size specified shall be clear internal dimensions. These will generally comprise of P.C.C. bed, brick masonry walls in cement mortar, P.C.C. coping, cement plaster from inside and outside and CI manhole frame and cover. The thickness and grade of P.C.C. thickness of walls and proportion of cement mortar for masonry and plaster shall be as per detailed drawing or shall be specified in the relevant item in BOQ.

- 1.7 Surface Box : This shall be of cast iron, well made and free from casting and other defects and shall conform to I.S. 3950-1979. All sharp edges shall be removed and finished smooth.

C.I. surface boxes shall be coated with a black bitumenous paint. The C.I. surface box shall be fixed on the top of masonry chamber in plain or reinforced cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size).

1.8 Measurements:

Masonry chambers and surface box shall be enumerated under the relevant items.

1.9 Rate:

The rate shall include the cost of materials and labour involved in all the operations described above, for specified depth except the excavation in soft or decomposed and hard rock.

2.0 DRAINAGE

2.1 STONEWARE PIPES

All pipes with spigot and socket ends shall conform to IS 651-1965 and shall be of grade 'A' or 'AA' as specified. These shall be sound, free from visible defects such as fine cracks or hair cracks. The glaze of the pipes shall be free from crazing. The pipes shall give a sharp clear note when struck with a light hammer. There shall be no broken blisters or chipping on the spigot or socket. The approximate thickness of 60 cm long pipes shall be as given in the table below:

Internal diameter of the pipe	Thickness of the barrel & of socket	Wt. Of each pipe per m
Mm	Mm	mm
100	12	14
150	16	22
200	17	33
230	19	44
250	20	52
300	25	79

The length of the pipes shall be 60 cm exclusive of the internal depth of the socket. The pipes shall be handled with sufficient care to avoid damage to them.

2.1.1 Trenches for stoneware pipe drains.

Unless otherwise mentioned the widths of trenches for various dia of stoneware pipes shall be as given in the table below for depth upto 3 m.

Size of the pipe	Width of trench
150 dia	0.8 m
230 dia	0.9 m
300 dia	0.9 m

Wherever depth exceeds 3 m the width will be increased by 0.1 m.

2.1.2 Bedding of pipes:

The pipes shall be carefully laid to the alignments, levels and gradients shown on the plans and sections. Great care shall be taken to prevent sand etc. from entering the pipes. The pipes between two manholes shall be laid truly in a straight line without vertical or horizontal undulation. The pipes shall be laid with socket up the gradient. The body of the pipe shall be for its entire length rest on an even bed of concrete and places shall be excavated in the concrete to receive the socket of the pipe.

Pipes shall be provided with P.C.C. bedding haunching or encasing wherever necessary, for depths less than 1.0 m upto the crown and 3 m or more, the pipes shall be provided with P.C.C. bedding consisting of P.C.C. bed of minimum 15 cm thickness below the pipe and project 15 cm on either side of the pipe. The concrete shall extend upto the centre of the pipe.

Where pipes are not bedded on concrete, the trench floor shall be left slightly high and carefully bottomed up as pipe laying proceeds so that the pipe barrels rest on firm and undisturbed ground. If the excavation has been carried too low, the desired levels shall be made up with concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) for which no extra payment shall be made.

If the floor of the trench consists of rock or very hard ground that cannot easily be excavated to a smooth surface the pipe shall be laid on a levelling course of concrete as desired.

2.1.3 Jointing:

Tarred gasket of hemp yarn soaked in thick cement slurry shall first be placed round the spigot of each pipe and the spigot shall then be slipped home well into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and the gasket caulked tightly home so as to fill not more than 1/4th of the total depth of the socket.

The remainder of the socket shall then be filled with a stiff mixture of cement mortar in the proportion of 1:1 (1 cement : 1 fine sand). When the socket is filled, a fillet shall be formed round the joint with a trowel forming an angle of 45 deg with the barrel of the pipe. The joints shall be tested hydraulically as per para 2.1.4 and no concreting for encasement shall be done unless pipes are tested and at least 24 hours elapse after the pipes are jointed. After a day's work any extraneous material shall be removed from the inside of the pipe. The newly made joints shall be cured.

2.1.4 Testing of Joints:

Hydraulic test: Stoneware pipe used for sewers shall be subjected to a test pressure of 1.5 m or required head of water at the highest point of the section under test. The test shall be carried out by suitably plugging the lower end of the drain and the ends of the connection if any and filling the system with water. A knuckle bend shall be temporarily jointed in at the top end and a sufficient length of vertical pipe jointed to it so as to join with a connection to a hose ending in a funnel which could be raised or lowered till the required head is obtained and fixed suitably for observation.

During the test the required head is maintained for 30 minutes by adding water from a measuring vessel at 10 minutes interval and the average quantity added shall not exceed 1 litre per hour per 100 m length per 10 mm dia of pipe. Where leakage will be visible, the defective part of the work shall be removed and made good, at no extra cost, and retested until the test is

satisfactory.

2.1.5 Refilling of Trenches: Clause 1.5.8 under water supply shall apply.

In case where pipes are not bedded on concrete special, care shall be taken in refilling trenches to avoid the displacement and subsequent settlement at the surface resulting in uneven surfaces and dangers to foundations etc. The backfilling material shall be packed by hand under and around the pipe and rammed with a shovel and light temper. This method of filling will be continued upto the top of pipe. The refilling shall rise evenly on both sides of the pipe continued upto 60 cm above the top of pipe so as not to disturb the pipe. No tamping should be done within 15 cm of the top of pipe.

2.1.6 Measurements:

The lengths of pipes shall be measured in running meters nearest to a cm, as laid or fixed from inside of one manhole to the inside of the other manhole. The length shall be taken along the centre line of the pipes over all fittings such bends, junctions, etc., which shall not be measured separately.

Excavation, refilling, shoring and timbering in trenches and cement concreting wherever required shall be measured separately under relevant items of work, or may be clubbed with the item of pipe laying in which case max. depth of excavation shall be specified. In either case excavation in rock if met with shall be paid separately. Whenever excavation is paid separately the width specified, shall only be paid (Ref. Table 2.1.2).

2.1.7 Rate:

The rate shall include the cost of materials and labour involved in all the operations described above, and as described in the bills of quantities.

2.2 S.W. Gully Trap:

Gully traps shall conform to IS:65-1865. These shall be sound, free from visible defects such as fire cracks or hair cracks. The glaze of the traps shall be free from crazing. They shall give a sharp clear note when struck with light hammer. There shall be no broken blisters. The size of the gully trap shall be specified and all dimensions will be as per I.S. and shall be installed in chamber as described hereafter.

Each gully trap shall have one C.I. grating of square size corresponding to the dimensions of inlet of gully trap. It will also have a water tight C.I.L. cover with frame inside dimensions 300 x 200 mm the cover weighing not less than 2.72 kgs. The grating cover and frame shall be of sound and good casting and shall have truly square machined seating faces.

2.2.1 Excavation:

The excavation for gully traps shall be done true to dimensions and levels as indicated on plans or as directed by the Engineer-in-Charge.

2.2.2 Fixing:

The gully trap shall be fixed on cement concrete foundation 600 x 600 cm square and not less than 10 cm thick. The mix for the concrete will be 1:5:10 (1 cement : 5 fine sand 10 graded stone aggregate 40 mm nominal size). The jointing of gully outlet to the branch drain shall be

done similar to jointing of S.W. pipe as directed in 2.1.3.

2.2.3 Brick Masonry Chamber:

After fixing and testing gully and branch drain, a brick masonry chamber 300 x 200 (inside) in second class bricks in cement mortar 1:5 (1 cement : 5 fine sand) shall be built with a 115 mm thick brick work round the gully trap from the top of the bed concrete upto ground level. The space between the chamber walls and the trap shall be filled in with cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stones aggregate). The upper portion of the chamber i.e. above the top level of the trap shall be plastered inside with cement mortar 1:3 (1 cement : 3 coarse sand), finished with a floating coat of neat cement. The corners and bottom of the chamber shall be rounded off as to slope towards the grating and form a hopper.

C.I. cover with frame 300 x 200 mm (inside) shall then be fixed on the top of the brick masonry with cement concrete 1:2:4 (1 cement : 2 coarses and :4 graded stone aggregate 20 mm nominal size) and rendered smooth. The finished top of cover shall be left about 4 cm. Above the adjoining ground level so as to exclude the surface water from entering the gully trap.

2.2.4 Measurements:

The gully trap shall be enumerated. Excavation shall be measured separately under relevant items of earth work or may be clubbed with the item.

2.2.5 Rate:

The rate shall be per number and will include the cost of materials and labour involved in all the operations described above.

2.3 Cement Concrete Pipes:

The pipes shall be R.C.C., NP2 or NP3 class as specified. These shall conform to IS:458-1961. The reinforced cement concrete pipes shall be manufactured by centrifugally cast or spun./ 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.

Concrete used for the manufacture of reinforced concrete pipes and collars shall not be leaner than 1:2:4 (1 cement : 2 coarses sand : 4 graded stone aggregate). The max size of aggregate should not exceed one third of the thickness of the pipe or 20 mm whichever is smaller. The reinforcement in the reinforced concrete pipe shall extend throughout the length of the pipe. The circumferential and longitudinal reinforcements shall be adequate to withstand the specified hydrostatic pressure and further bending stresses due to the weight of water when running full across the span equal to the length of pipe plus three times it's own weight.

2.3.1 Trenches for concrete pipe: Para 2.1.1 shall apply. Where the pipe shall be bedded directly on soil, the bed shall be suitably rounded to fit the lower part of the pipe, the cost for this operation being included in the rate for laying the pipe itself.

2.3.2 Laying of Pipes:

Loading, transporting and unloading of concrete pipes shall be done with car. Handling shall be such as to avoid impact. Gradual unloading by inclined planes or by chain pulley block is recommended. All pipe sections and connections shall be inspected carefully before being laid.

Broken or defective pipes or connections shall not be used. Pipes shall be lowered into the trenches carefully. Mechanical appliances may be used. Pipes shall be laid true to line and grade as specified. Laying of pipe shall proceed upgrade of a slope.

If the pipes have spigot and socket joints, the socket end shall face upstream. In the case of pipes with joints to be made with loose collars, the collars shall be slipped on before the next pipe is laid.

In case where the foundation conditions are unusual such as in the proximity of trees or holes, under existing or proposed manholes etc. the pipe shall be encased all round in 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) or compacted sand or gravel.

In case where the natural foundation is inadequate, the pipes shall be laid either in concrete cradle supported on proper foundation or on any other suitably designed structure as specified. If a concrete cradle bedding is used, the depth of concrete below the bottom of the pipe shall be at least 1/4th of the internal dia, and shall extend up the sides of the pipe at least to a distance of 1/4th of the outside diameter, for pipes 300 mm and over in dia. The pipe shall be laid in this concrete bedding before the concrete has set. Pipes laid in trenches in earth shall be bedded evenly and firmly and as far up the haunches of the pipe as to safely transmit the load expected from back-fill through the pipe to the bed. This shall be done either by excavation of the bottom of the trench to fit the curve of the pipe to form an even bed. Necessary provision shall be made for joints wherever required.

When the pipe is laid in a trench in rock hard clay, shale or other hard material, the space below the pipe shall be excavated and replaced with an equalizing bed of concrete, sand or compact earth. In no place shall pipe be laid directly on such hard material.

When the pipes are laid completely above the ground, the foundations shall be made even and sufficiently compacted to support the pipe line without any material settlement. Alternatively the pipe line shall be supported on p.c.c saddle blocks. Similar arrangement shall be made to retain the pipe line in the proper alignment, such as by shaping the top of the supports to fit the lower part of the pipe. The distance between the supports shall in no case exceed the length of the pipe. The pipe shall be supported as far as possible close to the joints. In no case shall the joint come in centre of the span. Care shall be taken to see that superimposed loads greater than the total load equivalent to the weight of the pipe when running full shall not be permitted.

2.3.3 Jointing of Pipes:

Joints are generally of rigid type, where specified flexible type joints may also be provided.

2.3.3.1 Spigot and socket joint (rigid): The spigot of each pipe shall be slipped home well into the socket of the pipe previously laid and adjusted in the correct position. The opening of the joint shall be filled with stiff moisture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) which shall be rammed with caulking tool. After a day's work, any extraneous material shall be removed from the inside of the pipe and the newly made joint shall be cured.

2.3.3.2 Collar Joint (rigid):

The two adjoining pipe shall be butted against each other and adjusted in correct

position. The collar shall then be slipped over the joint, covering equally both the pipes. The annular space shall be filled with stiff mixture of cement mortar 1:2 (1 cement : 2 fine sand) which shall be rammed with caulking tool. After a day's work, any extraneous material shall be removed from the inside of the pipe and the newly made joint shall be cured.

2.3.4 Testing of Joints, refilling of trenches, measurements and rate: Para 2.1.4 to 2.1.7 shall apply for stoneware and concrete sewers.

2.4 Manholes, Inspection Chambers, Storm Water Gullies etc.

2.4.1 Inspection Chambers:

Where depth of sewer is less than 1.5 m rectangular chambers shall be used having size as specified. Usual sizes are 450 x 900 or 6500 x 900. These shall be constructed in the sewer line at such places and levels and dimensions as indicated on the drawing. Sizes specified shall be clear internal dimensions of the chamber.

2.4.2 Manholes:

Where depth of sewer exceeds 1.5 m circular conical manholes shall be provided. Various types and sizes of manholes are specified for different depths. Typical drawing of various types of manholes shall be supplied to the contractors. In the absence of such drawings, the standard drawings of the KOTA SMART CITY LIMITED, Rajasthan sewerage department or local body if available shall be followed.

Manholes and inspection chambers which are provided on roads or where heavy vehicular traffic is expected are provided with heavy duty C.I. air tight frame and cover. For those built on foot paths carriage drives and cycle tracks medium duty covers are provided. For locations within domestic premises or areas not subjected to wheel traffic loads, they shall be provided with light duty covers.

2.4.3 Storm Water Gullies:

These shall be constructed for admitting storm water from the courtyard area. It is constructed of specified size and is provided with precast RCC or C.I. grating on top for admitting storm water run off into it. A typical drawing shall be provided giving all details of construction. Usual size shall be 600 x 600.

2.4.4 Construction of Manholes, Inspection Chambers and Gullies:

Even though the specifications that follow give general requirements of good construction, the detailed drawings supplied for manholes and inspection chamber will override the provisions in the specifications so far as thicknesses, proportions of mortar, P.C.C. etc. and in the event of conflict between the two the drawings shall prevail.

2.4.4.1 Excavation: This shall be done to dimensions and levels on the drawing.

2.4.4.2 Bed concrete: Base of the manhole shall be constructed in P.C.C. 1:3:6. Thickness shall be 200 mm upto 1.5 m and 300 mm for depths more than 1.5 m or as specified by the Engineer-in-charge.

2.4.4.3 Brickwork: Brickwork shall be in C.M. 1:5 constructed with second class bricks. Brick

masonry in arches and arching over the pipe shall be in C.M. 1:3. Walls shall be generally built in 230 mm thickness for inspection chambers and manholes upto a depth of 2.1 m and 350 mm for depth over 2.1. However, the exact thicknesses shall be based on structural design and shall be specified by the consultants or engineer-in-charge.

2.4.4.4 Plastering: Walls of manholes shall be plastered inside with 12 mm thick cement plaster 1:3 and finished smooth. Where ground water table is high external surfaces of manholes shall also be plastered in C.M. 1:3.

2.4.4.5 Vata: 75 mm fillet shall be made with C.M. 1:3 all round the external joint between the bed concrete and brick masonry wall of manhole.

2.4.4.6 Benching: Channels and benching inside the manhole or inspection chamber shall be done in C.C. 1:2:4 and rendered smooth with cement. The channel

provided shall be semicircular channel of the same dia as the dia of the sewer with vertical walls. The depth of channel shall be equal to the sewer diameter and the P.C.C. benching top will have a slope of 1 in 12 from the side walls to the channel.

2.4.4.7 P.C.C. Cap: PCC m.150 cap of 150 mm thickness shall be provided on top of manholes or inspection chambers for fixing the manhole frame.

2.4.4.8 Steps for footrest: Foot rests shall be C.I. rungs weighing 5.3 kg and conforming to IS 5455 - 1969 or made up of 20 mm dia. M.S. square or round bars as specified. These shall be embedded 20 cm deep in 20 x 20 x 10 cm blocks of PCC 1:3:6. The blocks with M.S. or C.I. foot rest placed in its centre shall be cast in site along with masonry.

Footrests shall be placed 300 mm apart vertically and 375 mm horizontally in staggered fashion. First footrest shall be 450 mm below top. Footrests shall be painted with bituminous paint and the portion embedded shall be painted with thick cement slurry before fixing.

2.4.4.9 Manholes frames and covers: Approximate weights for various dimensions of frames and covers of various duties shall be as follows:-

Size	Heavy Duty Kg	Medium Duty Kg	Light Duty Kg
Rect. 900x450	230	200	50
Rect. 900x600	275	251	70
Circular 530 dia	238	125	-

The covers and frames shall be neatly cast and shall be free from air and sand holes. They shall be neatly dressed and carefully trimmed. All castings shall be free from voids either due to shrinkage, gas inclusion or other causes. Covers shall have raised chequer design on the top surface to provide adequate non slip grip. The cover shall be capable of easy opening and closing and it shall be fitted in the frame in a workmanlike manner. Covers shall be gas and water tight. Size of the cover shall be the clear

internal dimensions of frame. 2.5% variation in weights shall be permissible. Covers and frames shall be coated with a black anticorrosive paint of bituminous composition.

The coating shall be smooth and tenacious. It shall not flow at 63 deg C and shall not drip off at 0 deg. C. The covers shall be so fixed as to be flush with ground surface. After completion the manhole covers shall be sealed by means of grease

- 2.4.4.10 Testing: Manhole after it is raised above highest expected subsoil water level in monsoon shall be tested for water tightness. The mouths of all pipes entering the manhole shall be suitably plugged with brick masonry or wooden or any other type of plug. Manhole under test shall then be filled with water upto general subsoil water level and the level observed for one hour. If the level does not drop off more than 50 mm in one hour, it shall be deemed as watertight. During testing the pit around shall be kept free of water and contractor shall observe the places where leakage takes place and take steps to correct the same.
- 2.4.5 Measurements: Manholes, inspection chambers, gullies etc. shall be enumerated under relevant items in the schedule of quantities. Depth shall be reconed from top of C.I. cover to the invert level of channel. Depth shall be measured to correct centimetre. The extra depth shall be measured as an extra over the depth specified under enumerated item and paid per running meter under separate item following the main item. Weight and duty of cover and frame shall be specified in the item.
- 2.4.6 Rate: The rate shall include the cost of materials and labour involved in all operations from 2.4.4.2 to 2.4.4.9 above upto specified depth in the item. Payment for extra depths shall be paid for separately under relevant item. Excavation and refilling is generally paid for separately under relevant item; or excavation can be clubbed with the item of manhole, but in that case maximum depth will have to be specified in the item. If the duty of the cover in the item is changed during execution by the Engineer-in-charge amount due to difference in weight of the cover shall be paid extra or deducted as the case may be.
- 2.5 Drop Connection: In cases where branch sewer enters the manhole of main pipe sewer at level higher than the main sewer by more than 600 mm a drop connection should be provided. A typical drawing for drop connection shall be supplied to the contractor.
- 2.5.1 Excavation: The excavation shall be done for the drops connection at the place where the branch line meets the manhole. The excavation shall be carried upto the bed concrete of the manhole and to the full width of the branch line.
- 2.5.2 Laying: At the end of branch sewer line a stoneware cross junction shall be fixed in the line which shall be extended through the wall of the manhole by a horizontal piece of S.W. pipe to form an inspection on cleaning eye. The open end inside the manhole shall be closed by providing chain and lid. The stoneware drop pipe shall be connected to the cross at the top and to the S.W. bend at the bottom. The bend shall be extended through the wall of the manhole by a piece of S.W. pipe which shall discharge into the channel.

Necessary channel shall be made with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) and finished smooth to meet the main channel in the direction of flow. The joint between S.W. pipe and fittings shall be cement

joint. The joint between S.W. cross and S.W. branch line shall be made with cement mortar 1:1 (1 cement : 1 fine sand) as per para 2.1.3 for S.W. pipes. The exposed portion of the drop connection shall be encased all round with a single brickwork in C.M. 1:4 and plastered in C.M. 1:3.

The holes made in the walls of the manholes shall be made good with brickwork in cement mortar 1:5 (1 part cement to 5 parts fine sand) and plastered with cement mortar 1:3 (1 cement : 3 coarse sand) on the inside of the manhole wall. The excavated earth shall be backfilled in the trench in level with the original ground level.

The top arm of the cross is covered with a tile or the arm of cross extended upto ground level by another S.W. pipe and then covered; to act as clean out for vertical portion of the drop, and shall be encased in brick work as for the drop pipe. The dia of drop pipe shall be 150 dia upto the sewer dia of 300 mm.

2.5.3 Measurements:

Drop connections shall be enumerated. The depths beyond 60 cm shall be measured in running meters correct to a cum under relevant items. This extra depth will be measured as difference of invert levels of main and meeting sewer minus 600 mm where the S.W. pipe is extended upto ground level for vertical clean out, the extra depth will be equal to depth of manhole minus 600 mm.

2.5.4 Rate: The rate shall include the cost of labour and materials involved in all the operations described above but excluding the cost of excavation refilling for a specified height and of 600 mm depth. Depths above 600 will be paid as extra over per meter.

2.6 Soil, Waste, Rain water, Vent and Anti-Siphonage Pipes and Fittings:

2.6.1 All soil, waste and anti siphonage pipes and fittings used within sunken floor areas or within plumbing shafts vertical run, shall be spun cast iron pipes, fittings conforming to IS 3989/1984 (i.e. centri pipes) or its subsequent revision. All cast iron pipes and fittings shall be of the best approved Indian make of soil variety preferably of spun quality and hot dipped in Dr. Agnus Smith Solution and free from flaws, air bubbles, cracks, sand holes and other defects, truly cylindrical and uniform in thickness. They shall not be brittle but shall allow for heavy cutting, chipping and drilling and shall not be less than 6 mm thick and of the diameter, mentioned in the schedule of quantities. They shall be of the largest length available and shall be fixed against the wall on special

'U' clamps - 25 mm wide, 3 mm thick and hot dip galvanised by means of round headed flat nail of 75 mm long on brick wall. In case of hollow block wall or brick masonry walls (if so specified) - 50 x 50 x 75 long teak wood gutties soaked in solignum paint should be first fixed to the wall pipes shall be fixed against these wooden blocks as above by clamps and nails and painted with two coats of paint.

2.6.2 Jointing shall be carried out with molten lead. The spigot of the pipe must be forced well home into the socket and must be entered, so that the joint may be of even thickness all round. At least, one complete lap of clean white hemp spun yarn shall be drawn into the socket without being forced through the joint into the pipe as may laps as may be needed to leave the space of not less than 25 mm for the lead. The lead shall then be poured into the joint and caulked tight.

The joints shall then be run with molten lead in sufficient quantity so that after being caulked solid, the lead may project 3 mm beyond the face of the socket against the outside of the spigot but must be flush with the outside edge of the socket. Minimum quantity of lead per joint for 100 and 75 mm dia pipes shall be 1.8 kg and 1.36 kg respectively.

- 2.6.2A The joints if specified in the respective items shall be done in cement mortar in place of lead. In case of cement jointing, the joints shall be done as specified in 2.5.3 but after the hemp soaked in thick cement slurry is forced into the socket for one complete lap, a stiff mixture of cement mortar in proportion 1:1 (1 part of cement to 1 part of clean fine sand) is filled in the remainder of the socket. When the socket is filled a fillet shall be formed round the joint with a trowel forming an angle of 45 deg with the barrel of the pipe and finished smooth and well cured.
- 2.6.3 Cleanouts at the head of C.I. S/S horizontal pipes running under the floor shall be of cast brass screwed in type. Floor and wall clean outs shall be of cast brass screwed type. The connecting pieces shall be of G.I. threaded coupling to suit the clean out with lead caulked joint.
- 2.6.4 Inspection chambers, gully traps, etc. within the building i.e. for diversion of pipes at upper floor or on service floors shall be of 'Patel Pattern' type cast iron chambers with bolts, nuts to close the cover, all to be fabricated as per actual requirement.
- 2.6.5 Supports, pedestals and base for inspection chambers, gully traps and pipes when provided as per 2.5.4 above shall be in 1:2:4 cement concrete mix.
- 2.6.6 Pipe sleeves and inserts, etc. through RCC walls of buildings either external or internal or for water tanks shall be of C.I. or M.S. provided with water bar flange.
- 2.6.7 During installation, open ends of pipes shall be closed with a plug made of wood cut into required shape and covered with gunny bags to prevent access of dirt into the pipe.
- 2.6.8 G.I. waste pipes and fittings shall be of 'C' glass I.T.C. or equivalent with G.I. unions, tail piece reducers and connections to be provided between joints to either lead or C.I. Pipes.
- 2.6.8A Where so specified in BOQ waste pipes from fittings like basins, urinals, sinks etc. can be of appropriate dia in rigid P.V.C. with P.V.C. fittings joined with solution.
- 2.6.9 The sizes of branch waste pipes for different fittings shall be as follows:
- | | | |
|--------------------|---|--|
| Wash basin | - | 32 dia |
| Urinal | - | 40 dia |
| Sink | - | 40 dia |
| Nahani Trap | - | 50 dia |
| Special floor trap | - | 75 or 100 dia as required with bolted aluminium grating in 25x25 m.s. angle. |

Wash troughs - 50 dia.

Canteen wash areas - 50 mm dia

- 2.6.10 W.C. pan connectors shall be to suit the requirements as per drawing, with 40 dia vent horn for connection to the anti siphonage pipe. Pan connector shall be of C.I. or lead.
- 2.6.11 Connection to the sewage or storm water collection sumps to be perfectly water tight and as specified in the drawing.
- 2.6.12 Rain water flashing shall be of 150 x 100 or 230 x 150 fitted on to the bell mouth of rainwater pipes inlet and then covered with C.I. dome shape grating and extension piece.
- 2.6.13 All rainwater pipes and fittings shall be C.I. rain water variety conforming to IS 1729-1964 or equivalent. This shall apply to pipe outside buildings or within the building or in separate shafts.
- 2.6.14 The floor traps for toilet blocks shall be cast iron with C.P. brass grating, bolted down design. The traps shall be provided with minimum water seals of 40 to 50 mm.
- 2.6.15 Where toilet slabs are sunk, the floor trap shall be of 100 x 75 heavy type C.I. 'P' trap, with C.P. Brass grating, bolted down design.
- 2.6.16 Bathroom C.P. grating shall be of bolted down design out of heavy cast brass with the chromium plating of the best approved standard.
- 2.6.17 Cast Iron gratings shall be flat with perfect edge and of the best quality procurable of the specified width and thickness and in the available lengths.
- 2.6.18 Spigotted and socketed 75 mm, 100 mm and 150 mm C.I. pipes.
- The pipes shall be laid to a slope of minimum 1 in 100 but preferably in 1 in 50, and connected to the drain. On no account should lime or lime concrete come in direct contact, with the pipe. The pipes and traps are laid in the sunken slabs over the first coat of water proofing. After laying, testing and encasing, second coat of water proofing is given.
- After the C.I. drain pipes are laid in the sunken areas of toilets, they shall be encased in P.C.C. M10 all around upto the bed of finished floor and at least 8 to 10 cms on sides before filling in the floor with brickbat cobs.
- 2.6.19 Measurements: All pipes shall be measured along linear lengths including length over the fittings. The lengths over fittings shall be paid as extra over under relevant item. Alternatively straight pipes shall be measured along linear lengths along centre line excluding length over fittings and fittings shall be enumerated and paid per number. Whatever method of measurement is followed, the item in the schedule shall be worded accordingly. Traps, clean outs shall be enumerated.
- 2.6.20 Rates: Rates shall include supply of material and labour for installation of pipes and

traps, cleanout etc. as specified in the BOQ.

2.7 Lead Pipes

2.7.1 Lead pipes shall be of solid drawn lead, the size mentioned being their internal diameter and shall conform to the requirements of Indian Standard Specification

2.7.2 The weights of lead pipes for the various bores shall be as follows:

100 dia	11.4	kg per m	]	For soil, waste, anti
75 dia	8.5	kg per m	]	Siphonage and
65 dia	7.2	kg per m	]	Vent and fixture
50 dia	6.0	kg per m	]	Wastes
40 dia	4.47	kg per m]	

2.7.3 The joints between the lead pipes and other fittings shall be made with brass thimbles and tailpiece and jointing shall be with wiped solder joints.

3.0 SANITARY FITTINGS

All sanitary fittings shall be as specified in Schedule of Quantities and as approved by the Consultant/Architects. The same may also be procured by the Owner and issued for fixing if so desired.

3.1 Sanitary fitting include all fittings except water supply pipes and fittings, valves, drainage pipes and fittings. They will cover sanitary wares like W.C. pan, wash basin, urinals, bidets as well as water supply faucets like bib taps, stop cocks, showers, geysers, mixer faucets for showers and wash basins etc. They will also cover for all accessories concerned with the above like seats for WCs, traps, fixing brackets, waste couplings, flexible PVC or C.P. brass connector pipes. Other toilet fixtures like coat hooks, tower rails, soap dish, toilet paper holders, napkin holders, mirrors, liquid soap containers, book traps, extension pieces, wall flanges etc. will also be covered under these.

3.2 The items of sanitary fittings will either be supply and fixing including all accessories or supply of main fittings and/or accessories only and erection only as separate items.

3.2.1 For supply of fittings a separate schedule will be included under "Supply of Fittings" for the main fittings, and/or accessories in the bills of quantities and a separate item for erection only.

The supply items have to be completed including all accessories, fixing screws, nuts and bolts, etc. The price should include all taxes, duties, insurance loading and transport charges upto delivery at site. It should be distinctly understood that any/all materials in the schedule may be purchased by the Employer directly and supplied to the contractors free of cost. The respective items in such cases will not apply. The contractor, however, will be required to advise the Employer's representative on selection and completeness and

suitability of the accessories, their exact number and lengths and for checking of all materials packing while taking delivery from the suppliers and no payment will be made for such installation with all other accessories are as required to make the job complete is covered by the corresponding items for erection. The Employers will be at liberty to supply the fittings of a different make and/or type and the contractor will be bound to complete the installation work at his quoted rates.

Variation in installation charges due to changes in the items supplied will be admissible only if the Engineer is satisfied that such a change involves substantial difference in erection work.

- 3.2.2 The contractor should inspect the fittings as soon as they are received at site and point out any damages or shortfalls to the employer's representative. The materials will be deemed to have been taken over by the Contractor subject to defects/shortfalls accepted by the Employer's representative and the contractor shall be responsible for the same till handing over. Any further shortfalls/breakages etc. will be made good by the contractor at his cost. If any of the materials supplied to the Contractor is not handed over to the Employers in good order - either as a completed item or retained as surplus - all the cost actually incurred (or to be incurred at the prevailing rates) by the employers in the procurement and supply or such materials plus fifteen percent will be payable by the contractor to the Employers.
- 3.2.3 In case the contractor is required to supply the fittings, he should get the samples approved from the consultants/architects before ordering the same.
- 3.2.4 Every item of fittings will be described fully in the Bills of quantities and will generally include the accessories as given in succeeding paragraphs (3.1.3.1 to 3.1.3.5). Wherever reference to catalogue no. is given for a sanitary fitting item it is with reference of "Hindustan Sanitaryware" catalogues. In case a different make is supplied it should be equivalent to or nearer the similar Hindustan catalogue number specified.
- 3.2.4.1 Water closet will include the WC pan of specified pattern, S or P trap, seat and cover, flushing cistern or flush valve, water supply connector pipe and stop cock, flush pipe etc. as specified in the item including making water and drain connections.
- 3.2.4.2 Urinals will include set of urinal, pots of specified pattern, waste coupling, bottle traps, common flush tank or separate flush valves and distributor pipe for a set of one, two or three urinals, stop cock and connector pipe etc. The rate shall be for a unit of one, two or three urinals. The waste pipes, urinals channel and urinal partitions shall be paid for under separate items.
- 3.2.4.3 Wash basin will include wash basin of specified pattern with concealed or open brackets, fancy pillar tap with or without mixing valves, waste coupling and bottle trap, CP extension piece and wall flange stop cocks and connectors pipes etc. including making water and drain connections. Waste pipe will be paid separately. For a counter top basin size of counter, material and thickness shall be specified on architects' drawing. The rate will include cutting the counter for fixing basin and making holes for pillar tap etc.
- 3.2.4.4 Sinks shall include the Vitreous or Stainless steel sink, with or without drain board, waste coupling bottle trap of P trap. A stop cock, connector pipe and swan neck type pedestal tap may be included in the item - drain pipe shall be paid separately.

3.2.4.5 Water supply fittings shall be specified with approved makes. The makes and models shall be got approved by the contractors in respect of Bib taps, concealed stop cocks, bottle traps, mixer fittings and divertors, flush valves, shower heads.

3.2.4.6 Samples for various sanitary and CP fittings shall be got approved from architects, clients and consultant and the approved sample of each fitting shall be kept in the office by the contractor.

3.2.5 **Measurement:**

Sanitary fittings shall be enumerated in nos. and will include all the work specified in the respective items in the bills of quantities.

3.2.6 **Rate:**

For supply and erection, the rate shall be per no. of the fittings along with all accessories as described in the bills of quantities. For supply only the rate shall be per no. for the particular item in the bills of quantities and supply of fittings. For only erection, the rate will be per no. and include cost of all accessories except those covered under supply of fittings schedule and erection of site so as to make a complete installation of the fitting

4.0 HANGERS & SUPPORTS

Hangers are provided to support water supply or drainage pipes when they run parallel to the ceiling in space.

4.1 General: Proper solid angle iron/channel section, supports shall be provided for all pipes complete with clamps. Wherever insulations comes, wooden guide to support pipe on the angle iron hangers/supports, shall be provided. For attachment in concrete, "Dash" fasteners or Anchor plug type inserts or equivalent shall be used. Hangers shall be provided within 900 mm of all changes in direction of mains and a minimum of three hangers per expansion band wherever shown in drawings. Any additional structural steel angles, channels or other members not specifically shown but are required for proper support, shall be provided.

4.2 Where necessary additional hangers to be provided to arrest water hammers or hydraulic resonance with proper rubber paddings.

4.3 Hangers, shall be spaced as noted below, except on all soil pipe which shall have a hanger of multiple fittings and sufficient no. of hangers shall be provided to maintain proper slope without sagging.

A.	Pipe Sizes in mm	Hanger Rod Dia.
	20 through 50	10 mm
	65 through 125	12 mm
	150 and above	15 mm

B.	Pipe Sizes	Spacing of Supports
----	------------	---------------------

12 to 20 mm	1.5 m apart
25 to 40 mm	2 m apart
50 above	2 m apart or as per IS

- 4.4 Provide floor stands, wall brackets or masonry piers etc. for all lines running near the floor or near walls as those lines can be properly supported or suspended from the walls or floors. Pipe lines near concrete or masonry walls may be hung also by hangers carried from wall brackets at a higher level than pipes. Hanging of any pipe from another is prohibited.
- 4.5 Hanger: Clevis or band type hangers shall be provided. Hot water piping is to be provided with suspended supports as far as possible. Note that strap hangers are not permitted and clamps should be of removal type.
- 4.6 Insulated Hot Water Piping: A 40 mm thick timber support for direct support of hot water line is required. Timber supports are to rest in brackets.
- 4.7 For pipes running in shafts can be also hung away from the wall by supporting on an angle projecting from the wall and the pipe fixed to the angle by a U bolt and nut. This is true for soil waste and rain water pipes in shafts

5.0 VALVE AND PRESSURE GAUGES

- 5.1 Pressure gauges shall have not less than 115 mm dia. 35 mm gas threads, brass body, syphon and gauge cock of 10 mm size. Dial ranges shall be adequate for the pressure encountered and as specified.
- 5.2 Provide valves on branch pipe connection to mains and at connections to equipment where indicated. All valves are to be located for easy access and are to be full bore of pipe connected together. Support all valves wherever necessary. Valves are to be as per IS-780 (Class I) for C.I. sluice valve and to IS-770 for G.M. valves and tested and approved.
- 5.3 Valve Schedules:

Service	Type	Size	Rating	Ends	Materials
Water, Oil, Air, Steam (low pressure)	Gate	65 & under	300 psi/ 20 kg sq.cm.	Screwed	Bronze

Water	Gate	90 & over	20 kg/sq.mm.	Flanged	CI body bronze trim
Gas	Gate	65 & under	40 kg/sq.mm.	Flanged	Bronze/SS spindle & trim
Water, Oil, Air, Steam (low pressure)	Globe & Angle	65 & under	20 kg/sq.cm.	Screwed	Bronze
Water	Globe & Angle	65 & under	20 kg/sq.mm.	Screwed	Bronze

Service	Type	Size	Rating	Ends	Materials
Water	Globe	65 & under	20 kg/sq.mm.	Flanged	Iron Bronze trim
Water	Horizontal & Vertical check	65 & under	20 kg/sq.mm.	Screwed	Bronze
Water	Horizontal & Vertical check	65 & under	20 kg/sq.mm.	Flanged	Iron Bronze trim

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- 5.4 All globe and check valves shall have working parts suitable for hot and cold water, oil or gas as required. Valves shall be tagged with permanent label under hand wheel indicating type of duty.
- 5.5 Foot Valves: Provide cast iron body with brass disc and strainers of approved quality, wherever shown.
- 5.6 Strainers: C.I. pot strainer with G.M. mesh screen in perforated brass strainer body of approved manufacture are to be provided before valves. Provide each strainer with a cock for blowing down. Screening area of strainer shall be minimum of 5 times more than pipe area with 0.8 mm maximum size holes.
- 5.7 Pressure Reducing Valves:

Pressure reducing valves shall be "Leader" make bronze pilot operated spring loaded valves for reducing pressure from 2.5 kg/sq.m to 0.5 kg/sq.cm suitable for specified dia of pipe.

6.0 CUTTING, PATCHING, REPAIRING & MAKING GOOD

- 6.1 Cutting, patching and repairing required for the proper installation and completion of the work, specified in each division, including chasing, plastering, masonry work, concrete work, etc. and making good shall be carried out by the contractor wherever required. Holes which are cut oversize shall be refilled, with concrete so that a tight fit is obtained around the pipe or other passing through.

Any damages to water proofed location should not be patched up, without rectification by the water proofing agency (specialist contractor) to ensure his guarantee.

7.0 EQUIPMENT PROTECTION

- 7.1 Keep all pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect all piping, conduit, fixtures, equipment or apparatus. Any such items damaged prior to final completion or work shall be restored to its original conditions or replaced at no expense to the Owner.
- 7.2 Accessibility: The installation of valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustment, inspections, repairs, removal or replacement, shall be conveniently and accessibly located with reference to the finished buildings. Thermometers and gauges shall be installed so as to be easily read from the floor. For floor cleanouts minimum distance of 600 mm shall be available from any wall.
- 7.3 Inserts & Sleeves:

General: Layout work in advance of placing of concrete slabs or construction of walls, furnish and set inserts and sleeves necessary to complete the work. Cost of cutting or patching made necessary as a result of this operation shall be at no expense to the Owner. Openings shall be as per structural consultants approval.

8.0 EQUIPMENT, MATERIAL & WORKMANSHIP

- 8.1 Determine that each piece of equipment meets the detailed requirements of the contract documents and that it is suitable for the installation shown. Notify the Architect of any shortcomings found during the tendering period. Each piece of equipment furnished shall meet all detailed requirements of the contract documents. Equipments not meeting all requirements will not be acceptable, even though specified by name along with other manufacturers.
- 8.2 Where two or more units of the same class of equipment are furnished use product of the same manufacturer, Component parts of entire system need not be product of the same manufacturer. Furnish all materials and equipment, new and free from defects and of size, make, type, and quality8 herein specified or approved by the Architect of consultant. All shall be installed in a neat and workmanlike manner.

9.0 CLEANING, OPERATION & TESTS:

- 9.1 Plumbing equipment fixtures, piping, etc. shall be free of a stampings, markings (except those required by codes) iron cuttings and other foreign materials.
- 9.2 Hot, cold and drinking water systems shall be cleaned thoroughly filled and flushed with water.
- 9.3 The entire mechanical apparatus shall operate at full capacity without objectionable noise or vibrations.
- 9.4 Test all plumbing systems in the presence of the site engineer/supervisor and the Architect as herein specified. Provide all equipment materials and labour necessary for inspection and tests and repair all work, which does not pass the tests. After repairs are made, repeat test until unit systems is found satisfactory, to the above authorities. Carry out tests prior to concealing, insulating or back filling over any piping. No exceptions will be made.
- 9.5 Test entire system of soil, waste and vent piping by water after roughing in is completed and before the fixtures are set. After setting the fixtures, provide smoke test, after sealing all traps.
- 9.6 Water Test: Test entire system or sections of system by closing all openings in piping except the highest opening and filling system with water to the point of overflow. If the system is tested in sections, plug each opening except the highest opening of the section filled with water. Keep the water in system or in portion under test of or at least 45 minutes before inspection starts with test pressure/head lasting for two hours. The system must be tight at all joints.
- 9.7 Final Test: After fixtures are set, test the system with smoke test as follows:
- 9.8 Smoke Test: Fill traps with water, then introduce into a system a pungent thick smoke produced by one or more smoke machines. When smoke appears at stacks on the roof, plug stacks and allow pressure of 1 inch water column to build up in systems. Maintain pressure for 15 minutes before inspection starts. The system shall be tight at all joints.
- 9.9 Test all down spouts or rain headers and their branches within the building by water as

described for the above for soil, waste and vent system, as per 9.6.

- 9.10 All water piping: Hydro-static test 10 kg/sq.cm. or twice the working pressure. (Ref. Clause 1.1.6 for details)
- 9.11 All tests on pipes to be embedded in backfill or P.C.C. shall be completed before backfilling or embedding in P.C.C.
- 9.12 All systems shall be tested in sections required to expedite the work or other trades and meet construction schedules and final test on completion.
- 9.13 On completion of the works, the following tests shall be performed to the satisfaction of the consultants/clients representative before issue of virtual completion certificate, if so required.
- a. Smoke test
 - b. Hydraulic test
 - c. Self induced test for fixtures
 - d. Tests for anti-syphonage system
 - e. Pump rating and output
 - f. Inspection of all units and fixtures.
- 9.14 The contractor shall arrange on his own initiative for similar tests during the progress of works to ensure that there are no defects in material/workmanship in portions of work to be concealed or embedded under the floor or walls in ceiling.

10.0 MODE OF MEASUREMENT

- 10.1 All drain pipes shall be measured in linear lengths along the centre line of the drainage line laid. Deductions shall be made for chambers and fitting lengths, etc. The rate shall include all work as specified in the respective items unless a separate item, of excavation in any type of soil appears in the BOQ, the rate for laying pipes will include excavation. However, the item should specify the maximum depth of excavation.
- 10.2 Stoneware or cast iron gully traps, bends, junctions, sewer traps, etc. shall be measured in numbers as in above.
- 10.3 All cast iron spigot and socket or flanged pipes for water supply, shall be measured in linear lengths along the centre line completed. Deductions shall be made for fittings lengths. The rate shall include lead caulking or nut and bolt, rubber gasket, joints etc. complete as specified in the respective items.
- 10.3.1 Same rate shall be applicable for pipes of same size and material laid in building at any level or floor.
- 10.4 Cast iron fittings such as spigot and socket fittings, flanged fittings like tees, bends, tapers, cross etc., shall be measured in numbers and paid for separately or paid on basis of weight
- 10.5 The rock cutting shall be measured in cu.m. of the stacks of excavated rock. The deduction for voids being 40% of the stack measurement. Only the rock which is removed by chiseling or blasting etc., shall be measured for this item of work. Boulders shall not be considered as a rock. The excavated rock will become the owner's property. Where excavation is not included in the item, all the excavation will be first as excavation in any

type of soil and excavation in rock will be paid as extra over.

- 10.6 All cast iron pipes, such as soil, waste, vent and rain water shall be measured in linear lengths along the centre line to nearest cm, as completed including length over fittings. The rates shall include all joints and clamps, etc. as specified in the respective items.
- 10.7 Length over cast iron fittings, for soil, waste, vent or rain water pipes like single or double wyes of various degrees bends cowls etc. shall be measured in metres as extra over in the item for 10.6 above.

Or

Alternately the C.I. pipes shall be measured in lengths upto fittings and fittings shall be enumerated and paid per no.

- 10.8 Plain cement concrete for supports and for encasement or bedding etc. shall be measured as specified in the respective items in the schedule of quantities either in cu.m. or clubbed with relevant item of work; or may be paid per meter length of encasement, for different dia of pipe.
- 10.9 Lead pipes shall be measured in linear length and shall be of weights as per specifications of the respective item in installation work. The rates shall include making of necessary offsets and bends, etc. The brass fittings with solder joints shall be paid extra in nos.
- 10.10 All sanitary fittings and fixtures shall be measured in numbers and the rate shall include all the work specified and described under each item in the schedule of quantities.
- 10.11 All G.I. pipes shall be measured in linear lengths along the centre line of the pipe, including G.I. fittings. The rate for pipe line upto and including 50 mm dia shall be inclusive of all G.I. fittings. In the case of pipe line of dia. 65 and above G.I. fittings will be measured and paid per nos., after deducting the lengths over fittings from linear measurements. The rate in all cases will be inclusive of all work as specified in the respective items. Lengths over valves shall be excluded
- 10.12 All peet valves, ball valves, non-return valves, sluice valves, pressure reducing valves, etc. shall be measured in numbers after excluding them from linear measurement
- 10.13 The diameters of pipes and fittings mentioned in the specifications are the inside nominal diameters in all cases unless otherwise stated. H.D.P.E. and PVC pipes shall be specified as outside diameter and class of pipe.
- 10.14 In case fittings of C.I., G.I. or stoneware with unequal bore, the largest bore shall be measured.

11.0 TOOLS & MATERIALS & STORAGE

- 11.1 The contractor at his own cost and charge shall provide all materials, tools, tackles, scaffolding, labour and water, necessary for the completion of the whole work in all respects.
- 11.2 The contractor shall pay the fees for testing the materials if directed by the Architects and local authorities or other statutory authorities.

- 11.3 The contractor will obtain, from time to time, various permissions and the completion certificates as per rules of all local and statutory; authorities.
- 11.4 The contractor shall co-ordinate for the material and storage facility with the Building Contractor.
- 11.5 Any materials, brought at site, shall not be removed without the written authority of the Architects or Consulting Engineer and when the contractor shall have received payment in respect of any certificates in which it is stated that the value of any unfixed materials on the work has taken into account, such materials shall become the property of Employer and the Contractor shall be liable for any loss or damage hereto.
- 11.6 The contractor shall insure the work against damages, for such sum as the Architects or Consulting Engineers may from time to time direct. All Insurance policies are yet to be taken out in the joint name of Employer and the Contractor in an office selected by the Architect or Consulting Engineer and all policies and receipts shall be deposited with Architects or Consulting Engineers.
- 11.7 All the brackets and hangers for pipes shall be fixed to the wall or RCC slab using 'Dash' fasteners wherever necessary.
- 11.8 The amount shown against the provisional item and/or contingencies in the schedule are provisional and for the estimating purposes only and the Contractor is neither concerned for its execution nor to charge any commission on these items. The owner reserves the right to get the work done for these items through a separate independent contractor.
- 11.9 Surplus material from the site shall be carted away by the Contractor without any cost to the Employer and the storage space provided to the Contractor shall be handed over to the employer clean and ready for occupation.

12.0 SAFETY CODES

- 12.1 First aid appliance including adequate supply of sterilised dressings and cotton wool shall be maintained in a readily accessible place
- 12.2 An injured person shall be taken to a public hospital without loss of time, in cases where the injury necessitates hospitalisation.
- 12.3 Suitable and strong scaffolds should be provided for workmen for all works that cannot safely be done from ground level.
- 12.4 No portable single ladder shall be over 8 metres in length. The width between the side rails shall not be less than 30 cm (clear) and the distance between two adjacent rungs shall not be more than 30 cm. When a ladder is used an extra mazdoor shall be engaged for holding the ladder.
- 12.5 The excavated material shall not be placed within 1.5 metres of the edge of the trench or half of the depth of trench whichever is more. All trenches and excavations shall be provided with necessary fencing and lighting.
- 12.6 Every opening in the floor of a building or in working platform be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be one metre.

- 12.7 No floor, roof or other part of the structure shall be so overloaded with debris or materials as to render it unsafe.
- 12.8 Workers employed on mixing and handling material such as asphalt, cement mortar or concrete and lime mortar shall be provided with protective footwear and rubber hand gloves.
- 12.9 Those engaged in welding works shall be provided with Welder's protective eye shields and gloves.
- 12.10 (I) No paint containing lead or lead products shall be used except in the form of paste or readymade paints.
- (ii) Suitable face masks should be supplied for use by the workers when the paint is applied in the form of spray or surface having lead paint dry rubbed and scrapped.
- 12.11 Overalls shall be supplied by the Contractor to the painters and adequate facilities shall be provided to enable the working painters to wash during the periods of cessation of work.
- 12.12 Hoisting machines and tackle used in the works, including their attachments, anchorage and supports shall be in perfect condition.
- 12.13 The ropes used in hoisting or lowering material or as a means of suspension shall be of durable quality and adequate strength and free from defects.

LIST OF APPROVED MAKES OR BRANDS

Unless otherwise mentioned any one of the approved makes or brands shall be allowed to be used. Other specified ISI mark may be allowed to be used if approved by the architects/consultants.

The contractors shall distinctly understand that it will not be their prerogative to insist on a particular brand from the list. Final selection will be done with the approval of the clients and architects

Contractors shall specify for what brand they have quoted in case there is a large variation in the rates of different approved brands

1. G.I. Pipe & Fittings : JINDAL, TATA, GST
2. C.I. Soil, Rainwater Pipes and Fittings : SAINT GOBAIN, NECO, KAPILANSH
3. Stoneware Pipes : KASHMIRA, BURN & CO., NAVROJI VAKIL, RAJURA.
4. RCC Pipes : INDIAN HUME PIPE, SPUN PINES, PREMIER.
5. Brass & Gun metal globe, gate valves, peet valves, pressure reducing valves : SKS, ZOLOTO full bore.
6. Sanitary Fixtures : HINDWARE, PARRYWARE, NYCER.
7. Water Supply fancy fittings like pillar taps, stop cocks, shower etc. :
ESSCO, JAQUAR, GEM, METRO.
8. Flush Valves : NELSON, R.R., JAQUAR.

9. Flush Tank P.V.C.: COMMANDER, CHAMPION, DUAL FLUSH, SLIMLINE.
10. Storage Heaters : RACOLD, SPHEREHOT, VENUS, BAJAJ.
11. Water Coolers : VOLTAS, BLUE STAR.
12. C.I. Grating : NECO, SAINT GOBEN, KAPILANSH
13. P.R.V. : LEADER, ZOLOTO, HONELWELL
14. Pump : SHREYAS HYDROTECH LUBI, WILO, HBD, ITT, GRUNDFOSS.
15. P.V.C. SWR Pipes : IS 13592-92 – GEORGE FISCHER , SUPREME
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1. General Provisions

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Definitions	1.1	In the Conditions of Contract (these General Conditions) which include Special Conditions, the following works and expressions shall have the meaning stated as under. Words indicating persons or parties include firms, companies, and other legal entities except where context requires otherwise.
The Contract	1.1.1	
	1.1.1.1	Bill of Quantities (BOQ) means the priced and completed Bill of Quantities forming part of the Bid. Activity Schedule means the various stages of execution of the Works in case of Lump Sum Contract which are linked to payment Schedule.
	1.1.1.2	Contract means the document forming the Bid and acceptance thereof and the formal agreement executed between the competent authority on behalf of the Governor of Rajasthan and the Contractor, together with the documents referred to therein including these conditions, the Specifications, designs, Drawings and instructions issued from time to time on Contract and shall be complementary to one another.
	1.1.1.3	Contract Agreement means the Contract Agreement referred to in Sub-Clause 1.81 [Signing of the Contract].
	1.1.1.4	Contract Data means the pages completed by the Procuring Entity entitled Contract Data which constitute the Special Conditions of the Contract.
	1.1.1.5	Drawings means the Drawings of the Works, as included in the Contract and any additional and modified drawings issued by (or on behalf of) the Procuring Entity in accordance with the Contract.
	1.1.1.6	Letter of Acceptance means the letter of formal acceptance, signed by the Procuring Entity, including any annexed memoranda comprising agreements between and signed by both Parties. If there is no such Letter of Acceptance, the expression "Letter of Acceptance" means the Contract Agreement and the date of issuing the Letter of Acceptance means the date of signing the Contract

		Agreement.
	1.1.1.7	Letter of Technical/ Financial Bid means the document entitled Letter Technical or Letter of Financial bid, which was completed by the Bidder and includes the signed offer to the Procuring Entity for the Works.
	1.1.1.8	Risk and Cost means when the Contractor fails to complete the Contract despite due notices, the procuring entity may terminate the Contract with full 10% compensation and/ or measure the acceptable work done and get the balance work of the BOQ/ Activity Schedule carried out at the risk and cost of the Contractor and the difference of cost at which the balance work is carried out through the Department/ Organisation or another agency is debited to the Contractor.
	1.1.1.9	Schedules means the document(s) entitled Schedules, completed by the Contractor and submitted with the letter of Bid, as included in the Contract. Such documents may include the Bill of Quantities, data, lists and Schedules of rates and /or prices.
	1.1.1.10	Specifications means the BIS, IRC, and other Codel Specification of the Works followed by relevant Department of the Government of India/ State Government and /or included in the Contract and any modification or addition made or approved by the Engineer-in-Charge.
	1.1.1.11	Technical/ Financial Bid means the Letter of Technical or Financial Bid and all other documents which the Bidder submitted with the Letter of Technical or Financial Bid, as included in the Contract.
Parties and Persons	1.1.2	
	1.1.2.1	Party: means the Procuring Entity or the Contractor, or both as the context requires.
	1.1.2.2	Contractor shall mean the individual, firm or company, whether incorporate or not undertaking the Works and shall include the legal or authorised representative of such individual or the persons composing such firm or company or the successors of such firm or company and the permitted assignees of such individual, firm or company.
	1.1.2.3	Contractor's Personnel means the Contractor and Contractor's Representative and all personnel whom the Contractor utilizes on Site, who may include the staff, labour and other employees of the Contractor and of each Subcontractor; and any other personnel assisting the Contractor in the execution of the Works. All communications addressed to the Contractor can be

		handed over at site to the Contractor's personnel.
	1.1.2.4	Contractor's Representative means the person named by the Contractor in the Contract or appointed from time to time by the Contractor under Sub-Clause 4.5 [Contractor's Representative], who acts on behalf of the Contractor.
	1.1.2.5	Engineer-in-Charge or Engineer means the Divisional officer / Executive Engineer who shall be in-charge of the Works and who shall sign the Contract on behalf of the Governor of Rajasthan and who shall be responsible for supervising the Contract, administering the Contract, certifying payments due to the Contractor, issuing and valuing Variations to the Contract, awarding extension of time, valuing the Compensation events, etc.
	1.1.2.6	The Procuring Entity or PE means the Party who employs the Contractor to carry out the Works.
	1.1.2.7	Procuring Entity's Personnel means the Engineer-in-Charge, the assistants referred to in Sub-Clause 3.2 [Delegation by the Engineer-in-Charge] and all other staff, labour and other employees of the Engineer-in-Charge and of the Procuring Entity; and any other personnel notified to the Contractor, by the Procuring Entity or the Engineer-in-Charge, as Procuring Entity's Personnel.
	1.1.2.8	Subcontractor means any person / firm named in the Bid /Contract and approved by the Engineer-in-Charge as a Subcontractor, or any person appointed and approved as a Subcontractor subsequently, for a part of the Works; and the legal successors in title to each of these persons/ firms.
Dates, tests and periods of completion	1.1.3	
	1.1.3.1	Base Date means the date 28 Days prior to the last date specified for submission of the Bid.
	1.1.3.2	Commencement/start Date means the date specified under Sub-Clause 8.3.1 [Commencement of Works].
	1.1.3.3	A Defect is any part of the Works not completed in accordance with the approved specifications, designs and/ or drawings of the Contract.
	1.1.3.4	The Defect Liability Certificate is the certificate issued by Engineer-in-Charge after Defect Liability Period has ended and upon correction of Defects pointed out by the Engineer-in-Charge.

	1.1.3.5	The Defect Liability Period will be decided by the Department/ Organisation depending on nature of the Works, from the date of completion of the Works and shall be mentioned in the Contract Data.
	1.1.3.6	Defects Notification Period means the period for notifying Defects in the Works or a Section (as the case may be) under Sub-Clause 13.2 [Completion of Outstanding Work and Remedying Defects], which extends over twelve Months except if otherwise stated in the Contract Data (with any extension under Sub-Clause 13.4 [Extension of Defects Notification Period], calculated from the date on which the Works or Section is completed as certified under Sub-Clause 12.1 [Taking Over of the Works and Sections].
	1.1.3.7	Performance Certificate means a certificate issued under Sub-Clause 13.10 [Performance Certificate].
	1.1.3.8	Taking-Over Certificate means a certificate issued under Sub-Clause 12.1[Taking Over of the Works and Sections].
	1.1.3.9	Tests on Completion means the tests which are specified in the Contract or agreed by both Parties or instructed as a Variation, and which are carried out under Clause 11 [Tests on Completion] before the Works or a Section (as the case may be) are taken over by the Procuring Entity.
	1.1.3.10	Tests after Completion means the tests (if any) which are specified in the Contract and which are carried out in accordance with the Specification after the Works or a Section (as the case may be) is taken over by the Procuring Entity.
	1.1.3.11	The Intended Completion Date is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Engineer-in Charge by issuing an extension of time.
	1.1.3.12	Time for Completion means the time for completing the Works or a section (as the case may be) under Sub-Clause 8.4 [Time for Completion], as stated in the Contract Data (with any extension under Sub-Clause 8.6 [Extension of Time for Completion], calculated from Commencement Date.
	1.1.3.13	Day means calendar Day; Year means a period of 365 Days.
Money and Payments	1.1.4	
	1.1.4.1	Accepted Contract Amount means the amount accepted in the Letter of Acceptance for execution and completion of

		the Works and remedying of any defects and maintaining the Works, if stated in the Contract.
	1.1.4.2	Cost means all expenditure reasonably incurred (or to be incurred) by the Contractor, whether on or off the Site, including overhead and similar charges, but does not include profit.
	1.1.4.3	Final Payment Certificate means the Payment Certificate issued under Sub-Clause 15.9 [Issue of Final Completion Certificate].
	1.1.4.4	Final Statement means the statement defined in Sub-Clause 15.10 [Final Statement of Payments].
	1.1.4.5	Interim Payment Certificate means a Payment Certificate issued under Sub-Clause 15.5 [Issue of Interim Payment Certificate], other than the Final Payment Certificate.
	1.1.4.6	Market Rate of an item shall be the current rate as decided by the Engineer-in Charge on the basis of the Cost of Materials and Labour at the Site where the work is to be executed for a variation item.
	1.1.4.7	Payment Certificate means a Payment Certificate issued under Clause 15 [Contract Price, Payment and Lien].
	1.1.4.8	Provisional sums/ Lump sums means a sum (if any) which is specified in the Contract as a provisional sum, for the execution of any part of the Works or for supply of Plant, Materials or services under Sub-Clause 9.6 [Provisional Sums]. These are also moneys provided in the estimate of the project to pay for unforeseen / un-quantified items. It may also include lump sum provided in the estimate/ BOQ for unforeseen items to be paid after approval of analysis of rates of such items and charges payable to Government agencies or the contractor for approvals, service connections, extensions of services from the supply lines etc., as the case may be.
	1.1.4.9	Performance Security means an amount as percentage of the Accepted Contract Price deposited in the form of Bank Guaranteed or any other prescribed form deposited by the Contractor as a security for due performance of the Contract.
Works and Materials	1.1.5	
	1.1.5.1	Materials are all supplies, including consumables, used by the Contractor for consumption in the Works.
	1.1.5.2	Permanent Works means the Permanent Works to be executed by the Contractor under the Contract. These works shall have a defined designed life and durability.

	1.1.5.3	Plant means the apparatus, machinery and other equipment intended to form or forming part of the Permanent Works,
	1.1.5.4	Scope of work shall cover execution of all aspects of the Works as per the Contract.
	1.1.5.5	Section means a part of the Works specified in the Contract Data as a Section (if any).
	1.1.5.6	Specifications means the Specification (BIS, IRC etc. or specifications approved by the department or others) of the Works included in the Contract and any modification or addition made or approved by the Engineer-in Charge.
	1.1.5.7	Temporary Works are Works designed, constructed, installed, and removed by the Contractor which are needed for construction or installation of the Works.
	1.1.5.8	Work or Works shall, unless there is something either in the subject or context repugnant to such construction, be construed and taken to mean the Works by virtue of the Contract contracted to be executed whether temporary or permanent and whether original, altered, substituted or additional works.
Others	1.1.6	
Interpretation	1.1.6.1	Act means the Rajasthan Transparency in Public Procurement Act, 2012.
	1.1.6.2	Contractor's documents are the bids (technical and financial) submitted, softwares, bills, reports, drawings, designs, letters/ communications, test results, etc., submitted by the Contractor to the Procurement Entity in connection with the Contract.
	1.1.6.3	Department means any Department of Government of Rajasthan which invite Bids on behalf of Governor of Rajasthan as specified in Contract Data.
	1.1.6.4	Field laboratory means the Contractor's equipped laboratory provided with equipments, experienced personnel, consumables, books of specifications and codes for use on quality testing/inspections on the works.
	1.1.6.5	Force Majeure is defined in Sub-Clause 19.1 [Definition of Force Majeure].
	1.1.6.6	Government/ Governor of Rajasthan means the State Government of Rajasthan/ Governor of Rajasthan
	1.1.6.7	Laws means all the national or the state legislations, statutes, ordinances and other laws, and regulations and by-laws of India and Rajasthan and any legally constituted public authority.

	1.1.6.8	Procuring Entity's Equipments means the apparatus, machinery and vehicles (if any) made available by the Procuring Entity on hire for the use of the Contractor in the execution of the Works, as stated in the Specifications; but does not include Plant which has not been taken over by the Procuring Entity.
	1.1.6.9	Rules means the Rajasthan Transparency in Public Procurement Rules, 2013 and PWF & AR Rules
	1.1.6.10	Site shall mean land and/or other places on, into or through which work is to be executed under the Contract or any adjacent land, path or street through which work is to be executed under the Contract or any adjacent land, path or street which may be allotted or used for the purpose of carrying out the Contract.
	1.1.6.11	Site office means a suitable covered all weather usable space built by the Contractor at Site of Works at his cost for use by him and the Procuring Entity.
	1.1.6.12	Unforeseeable means not reasonably foreseeable by an experienced Contractor by the Base Date.
	1.1.6.13	Variations mean any change to the Works, which is instructed or approved as a variation under Clause 9 [Deviations, Variations and Adjustments].
	1.2	<p>In the Contract, except where the context requires otherwise</p> <p>a) words indicating one gender include all genders;</p> <p>b) words indicating the singular also include the plural and words indicating the plural also include the singular;</p> <p>c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing;</p> <p>d) "written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record;</p> <p>e) the word "tender" is synonymous with "bid" and "tenderer" with "bidder" and the words "tender document" with "bidding document".</p> <p>The marginal words and other headings shall not be taken into consideration in the interpretation of these Conditions.</p>
Communications	1.3	<p>Wherever these Conditions provide for the giving or issuing of approvals, certificates, consents, determinations, notices, requests and discharges, by one party to the other, these communications shall be:</p> <p>i. in writing and delivered by hand against receipt, sent</p>

		<p>by mail or courier, or transmitted using any of the agreed systems of electronic transmission as stated in the Contract Data; and</p> <p>ii. delivered, sent or transmitted to the address for the recipient's Communications as stated in the Contract Data. However:</p> <p>a) if the recipient gives notice of another address, communications shall thereafter be delivered accordingly; and</p> <p>b) if the recipient has not stated otherwise when requesting an approval or consent, it may be sent to the address from which the request was issued.</p> <p>Approvals, certificates, consents and determinations shall not be unreasonably withheld or delayed. When a certificate is issued to a Party, the certifier shall send a copy to the other Party. When a notice is issued to a Party, by the other Party or the Engineer-in-Charge, a copy shall be sent to the Engineer-in-Charge or the other Party, as the case may be.</p>
Law and language	1.4	<p>The Contract shall be governed by the laws of India and the State of Rajasthan.</p> <p>The ruling language of the Contract shall be English or that stated in the Special Conditions of Contract.</p>
Works to be carried out	1.5	<p>The Works to be carried out under the Contract shall, except as otherwise provided in these conditions, include all labour, materials, equipment, tools, plants, testing and quality assurance, and transport which may be required in preparation of and doing in the full and entire execution and completion of the Works. The descriptions given in the Schedule of Quantities (Activity Schedule in case of Lump Sum Contract) shall unless otherwise stated, be held to include wastage on Materials, carriage and cartage, carrying and return of empties, hoisting, setting, fitting and fixing in position and all other Labour necessary in and for the full and entire execution and completion of the Works as aforesaid in accordance with good practice and recognized principles to deliver a work of specified quality and durability conforming to designs, drawings etc.</p> <p>The Works include clearance, leveling and dressing of Site within a distance of 15 meters of the work site on all sides except where the building adjoins another building.</p>
Sufficiency of Tender/ Bid	1.6	<p>The Contractor shall be deemed to have satisfied himself before bidding as to the correctness and sufficiency of his Bid for the Works and of the rates and prices quoted in the Schedule of Quantities, which rates and prices shall, except as otherwise provided, cover all his obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the Works. He shall also be responsible for satisfying himself on the completeness of the documents /data provided by the</p>

		Procuring Entity. He shall not raise any objections or deficiencies or inaccuracies in such documents.
Discrepancies and adjustment of errors	1.7.1	The several documents forming the Contract are to be taken as mutually explanatory of one another, detailed Drawings being followed in preference to small scale Drawing and figured dimensions in preference to scale and special conditions in preference to General Conditions.
	1.7.2	In the case of discrepancy between the Bill of Quantities, the Specifications and/or the Drawings, the following order of preference shall be observed: <ul style="list-style-type: none"> • Description of Bill of Quantities • Particular detailed Specification and Special Condition, if any • Drawings / Designs • IRC / MORT & H , ASTHO Specification, if required • Indian Standard Specifications or B.I.S.
	1.7.3	If there are varying or conflicting provisions made in any one document forming part of the Contract, the Procuring Entity shall be the deciding authority with regard to the intention of the document and his decision shall be final and binding on the Contractor.
	1.7.4	Any error in description, quantity or rate in Bill of Quantities or any omission therefore shall not vitiate the Contract or release the Contractor from the execution of the whole or part of the Works comprised therein according to Drawings and Specifications or from any of his obligations under the Contract.
Signing of the Contract	1.8.1	The successful Bidder, after submitting the performance guarantee i.e. within 15 Days of receipt of Notification of Award or as specified in the Contract Data, shall attend the office of the Procurement Entity / Engineer- in-charge for authentication, signing and completion of the Contract document and execute the agreement consisting of: The notice inviting Bid, all the documents including Drawings, if any, forming the Bidding Document as issued at the time of invitation of bids and acceptance thereof together with any correspondence leading thereto, Standard Forms consisting of various standard Sub-Clauses with corrections up to the date stipulated in Contract Data along with annexure thereto and drawings etc. The Costs of stamp duties and similar charges (if any) imposed by Law in connection with entry into the Contract Agreement shall be borne by the Contractor.
Signed copy of Contract	1.8.2	The Contractor shall be furnished, free of Cost one signed copy of the Contract Documents together with all

Document to be given to Contractor		Drawings except standard Specifications (BIS or IRC or others), Schedule of Rates and such other printed and published documents, which shall be procured by the Contractor at his cost. These documents shall be deemed to be part of the Contract. These shall be kept in the Site office. None of these documents shall be used for any purpose other than that of this Contract.
Conditions of the Contract	1.8.3	The Contract shall be governed by the General Conditions of Contract (GCC). The Special Conditions of Contract (SCC)/ Contract Data, wherever applicable, shall supersede/ clarify the GCC to the extent specified.
Priority of Documents	1.8.4	<p>The documents forming the Contract are to be taken as mutually explanatory of one another. For the purposes of interpretation, the priority of the documents shall be in accordance with the following sequence:</p> <ul style="list-style-type: none"> (a) the Contract Agreement, (b) the Letter of Acceptance, (c) the Technical Bid and Financial Bid along with the letters of the Technical Bid and Financial Bid (d) the Contract Data/ Special Conditions of Contract, (e) the General Conditions of Contract, (f) the Scope of Work & Specifications, (g) the Drawings, (h) the Instructions to Bidders, (i) the Notice Inviting Bids, and (j) the Schedules and any other documents forming part of the Contract. <p>If an ambiguity or discrepancy is found in the documents, the Engineer-in-Charge shall issue any necessary clarification or instruction.</p>
Personnel	1.9.1	The Contractor shall employ the key personnel named in the Schedule of Key Personnel as referred to in the qualification criteria to carry out the functions stated in the Schedule or other personnel approved by the Engineer-in-Charge. The Engineer-in-Charge will approve any proposed replacement of key personnel only if their qualifications, abilities, and relevant experiences are substantially equal to or better than those of the personnel listed in the Schedule.
	1.9.2	If the Engineer-in-Charge asks the Contractor to remove a person who is a member of the Contractor's staff or his work force stating reasons, the Contractor shall ensure that the person leaves the Site within seven Days and has no further connection with the work in the Contract.
Procuring	1.10	The Procuring Entity is responsible for the excepted risks

Entity's Risks		<p>which are :</p> <p>(a) in so far as they directly affect the execution of the Works in India, the risks of war, hostilities, invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, riot commotion or disorder (unless restricted to the Contractor's employees), and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive, or</p> <p>(b) a cause due solely to the design of the Works, other than the Contractor's design.</p>
Contractor's Risks	1.11	<p>All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the Procuring Entity's risks are the responsibility of the Contractor.</p>
Procuring Entity's use of Contractor's documents	1.12	<p>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 Procuring Entity a non-terminable transferable non-exclusive royalty-free license to copy, use and communicate the Contractor's Documents, including making and using modifications of them. This license shall:</p> <ol style="list-style-type: none"> i. apply throughout the actual or intended working life (whichever is longer) of the relevant parts of the Works, ii. entitle any person in proper possession of the relevant part of the 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 in the case of Contractor's Documents which are in the form of 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. iii. The Contractor's Documents and other design documents made by (or on behalf of) the Contractor shall not, without the Contractor's consent, be used, copied or communicated to a third Party by (or on behalf of) the Procuring Entity for purposes other than those permitted under this Sub-Clause.
Contractor's use of Procuring Entity's	1.13	<p>As between the Parties, the Procuring Entity shall retain the copyright and other intellectual property rights in the Specification, the Drawings and other documents made by (or on behalf of) the Procuring Entity. The Contractor may,</p>

Documents		at his Cost, copy, use, and obtain communication of these documents for the purposes of the Contract. They shall not, without the Procuring Entity's consent, be copied, used or communicated to a third Party by the Contractor, except as necessary for the purposes of the Contract.
Care and Supply of documents	1.14	<p>The approved Specification, Designs and Drawings shall be in the custody and care of the Procuring Entity. Unless otherwise stated in the Contract, one copy of the Contract and of each subsequent Drawing shall be supplied to the Contractor, who may make further copies at his Cost.</p> <p>Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Procuring Entity. Unless otherwise stated in the Contract, the Contractor shall supply to the Engineer-in-Charge four copies of each of the Contractor's Documents.</p> <p>The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Specification, the Contractor's Documents (if any), the Drawings and Variations and other communications given under the Contract. The Procuring Entity's Personnel shall have the right of access to all these documents at all reasonable times.</p> <p>If a Party becomes aware of an error or Defect in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or Defect.</p>
Delays in issuing drawings or instructions.	1.15	<p>The Contractor shall give notice to the Engineer-in-Charge whenever the Works are likely to be delayed or disrupted if any necessary Drawing or instruction is not issued to the Contractor within a particular time, which shall be reasonable. The notice shall include details of the necessary Drawing or instruction, details of why and by when it should have been issued, and the nature and amount of the delay or disruption likely to be suffered if it is late.</p> <p>If the Contractor suffers delay and/or incurs Cost as a result of a failure of the Engineer-in-Charge to issue the notified Drawing or instruction within a time which is reasonable and is specified in the notice with supporting details, the Contractor shall give a further notice to the Engineer-in-Charge and shall be entitled subject to Sub-Clause 21.2 [Contractor's Claims] to an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.6 [Extension of Time for Completion],</p> <p>However, if and to the extent that the Engineer-in-Charge's failure was caused by any error or delay by the Contractor, including an error in, or delay in the submission of, any of the Contractor's Documents, the Contractor shall not be</p>

		entitled to such extension of time,
Confidential Details	1.16	<p>The Contractor's and the Procuring Entity's Personnel shall not disclose all such confidential and other information as may be reasonably required in order to verify compliance with the Contract and allow its proper implementation.</p> <p>Each of them shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out their respective obligations under the Contract or to comply with applicable Laws. Each of them shall not publish or disclose any particulars of the Works prepared by the other Party without the previous agreement of the other Party. However, the Contractor shall be permitted to disclose any publicly available information, or information otherwise required to establish his qualifications to compete for other projects.</p>
2. The Procuring Entity		
Right of Access to the Site	2.1	<p>The Procuring Entity shall give the Contractor right of access to, and possession of at least 80% of the Site within 30 days of signing of the Contract or within the time specified in the Special Conditions of Contract (SCC). If under the Contract the Procuring Entity is required to give to the Contractor possession of any foundation, structure, plant or means of access, the Procuring Entity shall do so in the time and manner stated in the Specification. However, the Procuring Entity may withhold any such right or possession until the Performance Security has been received.</p> <p>If the Contractor suffers delay as a result of a failure by the Procuring Entity to give any such right or possession within such time, the Contractor shall give notice to the Engineer-in-charge and shall be entitled subject to Sub-Clause 21.2 [Contractor's Claims] to an extension of time for any such delay, if completion is or will be delayed,</p> <p>After receiving this notice, the Engineer-in-charge shall proceed to agree or determine these matters</p> <p>However, if and to the extent that the Procuring Entity's failure was caused by any error or delay by the Contractor, including an error in, or delay in the submission of, any of the Contractor's Documents, the Contractor shall not be entitled to such extension of time.</p>
	2.2	The right and possession may not be exclusive to the Contractor.
Assistance by Procuring Entity	2.3	<p>The Procuring Entity shall provide, at the request of the Contractor, such reasonable assistance as to allow the Contractor to obtain expeditiously any permits, licenses or approvals which the Contractor is required to obtain :</p> <ul style="list-style-type: none"> i. for the delivery of Goods, including clearance through customs, and

		<p>ii. for the export of Contractor's Equipment when it is removed from the Site.</p>
Procuring Entity's Personnel	2.4	<p>The Procuring Entity shall be responsible for ensuring that the Procuring Entity's Personnel and the Procuring Entity's other Contractors on the Site, co-operate with the Contractor's efforts under Sub-Clause 4.7 [Co-operation], and take actions similar to those which the Contractor is required to take under Sub-Clause 4.8 [Safety Procedures] and under Sub-Clause 4.17 [Protection of the Environment]</p>
Procuring Entity's Claims	2.5	<p>If the Procuring Entity considers himself to be entitled to any payment under any Sub-Clause of these Conditions or otherwise in connection with the Contract, and/or to any extension of the Defects Liability Period, the Procuring Entity or the Engineer-in-charge shall give notice and particulars to the Contractor. However, notice is not required for payments due under Sub-Clause 4.18 [Electricity, Water and Gas], under Sub-Clause 4.19 [Issue of Procuring Entity's Equipment and Materials], or for other services requested by the Contractor.</p> <p>The notice shall be given as soon as practicable and no longer than 28 Days after the Procuring Entity became aware, or should have become aware, of the event or circumstances giving rise to the claim. A notice relating to any extension of the Defects Notification Period shall be given 28 days before the expiry of such period.</p> <p>The particulars shall specify the Sub-Clause or other basis of the claim, and shall include substantiation of the amount and/or extension Defects Notification Period to which the Procuring Entity considers himself to be entitled in connection with the Contract. The Engineer-in-charge shall then proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the amount (if any) which the Procuring Entity is entitled to be paid by the Contractor, and/or the extension (if any) of the Defects Notification Period in accordance with Sub-Clause 13.4 [Extension of Defects Notification Period].</p> <p>This amount may be included as a deduction in the Contract Price and Payment Certificates. The Procuring Entity shall be entitled to set off against or make any deduction from an amount certified in a Payment Certificate, or to otherwise claim against the Contractor, in accordance with this Sub-Clause.</p>
Quality Control	2.6	<p>The Procuring Entity shall have the right to exercise proper Quality Control measures. The Contractor shall provide a fully equipped field laboratory, testing personnel, consumables and other assistance at his cost to conduct such tests. The Quality Control shall be in three tiers :</p> <ul style="list-style-type: none"> i) tier one by the Contractor's Engineers to the specified frequency, ii) by the Engineer-in-Charge's personnel to conform the

		<p>quality and acceptance of the work and</p> <p>iii) by the Technical Examiner's organisation or such other independent bodies of State Government/ the Department/ Organisation or QCI approved Third Party Quality Inspection Agency. The work shall have to be completed to conform to the specifications and shall be acceptable only after rectification of deficient /defective works as per 'Non Conformance Reports', if any, issued by the above mentioned agency or the Engineer-in-Charge.</p>
3. Engineer-in-Charge		
Duties and Responsibilities	3.1.1	<p>The Executive Engineer of the concerned Division will function as the Engineer-in-Charge for the purpose of the Contract or the Procuring Entity shall appoint another engineer as the Engineer-in-charge, as specified in the Contract Data, who shall carry out the duties assigned to him in the Contract and ensure execution of works as per approved drawings, designs, specifications etc.. The Engineer-in-charge's staff shall include suitably qualified Engineers and other professionals who are competent to carry out these duties.</p> <p>The Engineer-in-charge shall have no authority to amend the Contract. The Engineer-in-charge may exercise the authority attributable to the Engineer-in-charge as specified in or necessarily to be implied from the Contract. If the Engineer-in-charge is required to obtain the approval of the Procuring Entity before exercising a specified authority, he shall have to obtain that approval.</p>
	3.1.2	<p>The Procuring Entity shall promptly inform the Contractor of any change to the authority attributed to the Engineer-in-charge.</p> <p>However, whenever the Engineer-in-charge exercises a specified authority for which the Procuring Entity's approval is required, then (for the purposes of the Contract) the Procuring Entity shall be deemed to have given approval.</p> <p>Except as otherwise stated in these Conditions:</p> <ol style="list-style-type: none"> i. whenever carrying out duties or exercising authority, specified in or implied by the Contract, the Engineer-in-charge shall be deemed to act for the Procuring Entity; ii. the Engineer-in-charge has no authority to relieve either Party of any duties, obligations or responsibilities under the Contract; and iii. any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test, or similar act by the Engineer-in-charge (including absence of disapproval) shall not relieve the Contractor from any responsibility he has under the Contract, including responsibility for errors, omissions,

		<p>discrepancies , quality of works and non-compliances to specifications/ instructions of the Engineer-in-charge /Procuring Entity.</p> <p>iv. Any act by the Engineer-in-charge in response to a Contractor's request except otherwise expressly specified shall be notified in writing to the Contractor within 28 Days of receipt.</p> <p>The Engineer-in-charge shall obtain the specific approval of the competent authority before taking action under the following Sub-Clauses of these Conditions and other Sub-Clauses, if specified in the Contract Data:</p> <ul style="list-style-type: none"> i. Sub-Clause 4.12 [Unforeseeable Physical Conditions] agreeing or determining an extension of time and/or additional Cost. ii. Sub-Clause 9.1 [Right to Vary]: Instructing a Variation, except; <ul style="list-style-type: none"> (a) in an emergency situation as determined by the Engineer-in-charge, or (b) if such a Variation would increase the Accepted Contract Amount by less than the percentage specified in the Contract Data. iii. Approving a proposal for Variation submitted by the Contractor in accordance with Sub-Clause 9.1 [Right to Vary] or Sub-Clause 9.3 [Value Engineering]. <p>Notwithstanding the obligation, as set out above, to obtain approval, if, in the opinion of the Engineer-in-charge, an emergency occurs affecting the safety of life or of the Works / workmen or of adjoining property, he may, without relieving the Contractor of any of his duties and responsibility under the Contract, instruct the Contractor to execute all such work or to do all such things as may, in the opinion of the Engineer-in-charge, be necessary to abate or reduce the risk. The Contractor shall forthwith comply, despite the absence of approval of the competent authority, with any such instruction of the Engineer-in-charge. The Engineer-in-charge shall determine (after due approval from the competent authority) an addition to the Contract Price, in respect of such instruction, in accordance with Clause 9 [Deviations, Variations and Adjustments] and shall notify the Contractor accordingly, with a copy to the Procuring Entity.</p>
<p>Delegation by Engineer- in-Charge</p>	<p>3.2</p>	<p>The Engineer-in-charge may from time to time assign duties and delegate authority to assistants and may also revoke such assignment or delegation. These assistants may include a resident Engineer, and/or independent inspectors appointed to inspect and/or test items of works and/or Materials. The assignment, delegation or revocation shall be in writing and shall not take effect until copies have been received by both Parties.</p>

		<p>However, unless otherwise agreed by both Parties, the Engineer-in-charge shall not delegate the authority to determine any matter in accordance with Sub-Clause 3.5 [Determinations]</p> <p>Each assistant, to whom duties have been assigned or authority has been delegated, shall only be authorized to issue instructions to the Contractor to the extent defined by the delegation. Any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test, or similar act by an assistant, in accordance with the delegation, shall have the same effect as though the act had been an act of the Engineer-in-charge. However:</p> <ul style="list-style-type: none"> i. any failure to disapprove any work, Plant or Materials shall not constitute approval, and shall therefore not prejudice the right of the Engineer-in-charge to reject the work, Plant or Materials; ii. if the Contractor questions any determination or instruction of an assistant, the Contractor may refer the matter to the Engineer-in-charge, who shall promptly confirm, reverse or vary the determination or instruction.
Instruction of the Engineer-in-Charge	3.3	<p>The Engineer-in-charge may issue to the Contractor (at any time) instructions and additional or modified Drawings which may be necessary for the execution of the Works and the remedying of any Defects, all in accordance with the Contract. The Contractor shall only take instructions from the Engineer-in-charge, or from an assistant to whom the appropriate authority has been delegated under Sub-Clause 3.2. If an instruction constitutes a Variation, Clause 9 [Deviations, Variations and Adjustments] shall apply.</p> <p>The Contractor shall comply with the instructions given by the Engineer-in-charge or delegated assistant, on any matter related to the Contract. Whenever practicable, their instructions shall be given in writing. If the Engineer-in-charge or a delegated assistant:</p> <ul style="list-style-type: none"> i. gives an oral instruction, ii. receives a written confirmation of the instruction, from (or on behalf of) the Contractor, within two working Days after giving the instruction, and iii. does not reply by issuing a written rejection and/or instruction within two working Days after receiving the confirmation, then the confirmation shall constitute the written instruction of the Engineer-in-charge or delegated assistant (as the case may be).
Replacement of Engineer-in-Charge	3.4	<p>If the Procuring Entity intends to replace the Engineer-in-charge, the Procuring Entity shall inform the contractor by a notice before the intended date of replacement, the name and contact details of the intended replacement of the Engineer-in-charge.</p>

Determinations	3.5	<p>Whenever these Conditions provide that the Engineer-in-charge shall proceed in accordance with this Sub-Clause 3.5 to agree or determine any matter like variations, extensions of time, responsibilities / valuation for loss and or damage to works etc., the Engineer-in-charge shall peruse the Contract, Specifications, Codes and consult the Contractor in an endeavor to reach an agreement. If an agreement is not reached, the Engineer-in-charge shall make a fair determination in accordance with the Contract, taking due regard of all relevant circumstances.</p> <p>The Engineer-in-charge shall give notice to the Contractor of each agreement or determination, with supporting particulars, within 28 Days from the likely date of implementation of such agreement or determination and obtain receipt of the corresponding claim or request except when otherwise specified. The Contractor shall give effect to each determination unless and until revised under Clause 21 [Claims, Disputes and Arbitration].</p>
Minutes of Meeting	3.6	<p>The Engineer-in-charge may require the Contractor to attend a progress review / or quality assurance/ design review meeting during execution of the Works. The Engineer-in-charge shall record the minutes of the meeting and provide a copy within 7 days to the Contractor for compliance. These minutes will be a part of evidence in case of request for extension of time or variation or punitive action against the Contractor as per terms of the Contract.</p> <p>In case the issue of minutes is delayed, the Contractor may issue the record note of discussions and decisions taken in the meeting for record and confirmation by the Engineer-in Charge. These shall be treated as confirmed if not denied within 15 days by the Engineer-in-Charge.</p>
4. The Contractor		
General Obligations and Contractor's personnel.	4.1.1	<p>The Contractor shall design, prepare drawings (to the extent specified in the Contract), execute as per specifications and complete the Works in accordance with the Contract and with the Engineer-in-Charge's instructions, and shall remedy any Defects in the Works.</p> <p>The Contractor shall provide the Plant and Contractor's Documents specified in the Contract, and all Contractor's Personnel, Goods, consumables and other things and services, whether of a temporary or permanent nature, required in and for this design, execution, completion and remedying of Defects.</p>
	4.1.2	<p>The Contractor shall be responsible for the adequacy, stability and safety of all Site operations and of all methods of construction. Except to the extent specified in the Contract, the Contractor shall be responsible for all Contractor's Documents, Temporary Works, and such design of each item of works, Plant and Materials as is required for the item to be in accordance with the</p>

		specifications for items of Contract, and shall not otherwise be responsible for the design or Specification of the Permanent Works.
	4.1.3	The Contractor shall deploy experienced and competent personnel to execute the works. The quality of workmanship has to be as specified. Personnel not found capable of good workmanship shall be removed and replaced with better workman.
	4.1.4	The Contractor shall, whenever required by the Engineer-in-charge, submit details of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works. He shall also be responsible for the safety of works and personnel at the site and shall submit a safety execution plan (as per relevant code for safety at construction site) for the approval by the Engineer-in-charge. No significant alteration to these arrangements and methods shall be made without this having previously been approved by the Engineer-in-charge. He shall also comply to the requirements of the mitigations of the Environmental impacts of the execution of works.
	4.1.5	<p>If the Contract specifies that the Contractor shall design any part of the Permanent Works, then unless otherwise stated in the Special Conditions of Contract:</p> <ul style="list-style-type: none"> i. the Contractor shall submit to the Engineer-in-charge the Contractor's Documents for this part in accordance with the procedures specified in the Contract. ii. these Contractor's Documents shall be in accordance with the Specification and Drawings, shall be written in the language for communications defined in the Sub-Clause 1.4 [Law and Language] and shall include additional information required by the Engineer-in-charge to add to the Drawings for co-ordination of each Party's designs; iii. the Contractor shall be responsible for this part and it shall, when the Works are completed, be fit for such purposes for which the part is intended as are specified in the Contract; and iv. prior to the commencement of the Tests on Completion, the Contractor shall submit to the Engineer-in-charge the "as-built" drawings, designs and documents and, if applicable, operation and maintenance manuals in accordance with the Specification and in sufficient detail for the Procuring Entity to operate, maintain, dismantle, reassemble, adjust and repair all parts of the Works. Such part shall not be considered to be completed for the purposes of taking-over under Clause 12 [Taking Over of the Works and Sections] until these documents and manuals have been submitted to the

		Engineer-in-charge.
	4.1.6	The Contractor shall allow the Engineer-in-charge and any person authorized by the Engineer-in-charge access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where Materials or plant are being installed / assembled for the Works. The contractor may satisfy himself regarding site, acquisition of land, approach roads etc.
	4.1.7	The liability, if any, on account of quarry fees, royalties, octroi, service tax, and any other taxes and duties in respect of materials actually consumed on public work shall be borne by the Contractor.
	4.1.8	The cost of all water / power connections necessary for the execution of the Works and the cost of water consumed and hire charges of meters and the cost of electricity consumed in connection with the execution of the Works shall be paid by the Contractor except where otherwise specifically indicated. He shall also be responsible for environment mitigated disposal of waste water released during execution.
Compliance with the Code of Integrity	4.2.1	<p>The Contractor is bound by the provisions of the Code of Integrity stipulated in the Act , the Rules and specified in ITB Sub-Clause 1.3 [Code of Integrity] and refrain himself from corrupt, fraudulent, coercive and collusive practices which are defined as below:</p> <ul style="list-style-type: none"> a) “corrupt practice” means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party; b) “fraudulent practice” means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation; c) “coercive practice” means impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party; d) “collusive practice” means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party.
	4.2.2	The Procuring Entity shall take legal action against the Contractor, if it breaches any provisions of the Code of Integrity, under Section 11(3), 46 and chapter IV of the Act.

	4.2.3	The Contractor shall permit the Procuring Entity to inspect the Contractor's accounts and records relating to the performance of the Contract and to have them audited by auditors appointed by the Procuring Entity, if so required by the Procuring Entity.
Performance Security	4.3.1	<p>The Contractor shall have the option to furnish a Performance Security @ 10% of the Contract value, in Indian Rupees, in one of the following forms <i>[strike out which is not applicable]</i>:</p> <ul style="list-style-type: none"> i. Deposit through eGRAS; or ii. Bank Draft or Banker's Cheque of a Scheduled Bank in India; or iii. National Savings Certificates and any other script/ instrument under National Savings Schemes for promotion of small savings issued by a Post Office in Rajasthan, if the same can be pledged under the relevant rules. They shall be accepted at their surrender value at the time of Bid and formally transferred in the name of the Procuring Entity with the approval of Head Post Master; or iv. Bank guarantee. It shall be of a scheduled Bank in India in prescribed or other acceptable format or from other Issuer acceptable to the Procuring Entity. The bank guarantee shall be got verified from the issuing bank and confirmer, if any; or v. Fixed Deposit Receipt (FDR) of a Scheduled Bank in India. It shall be in the name of the Procuring Entity on account of Bidder and discharged by the Bidder in advance. The Procuring Entity shall ensure before accepting the Fixed Deposit Receipt that the Bidder furnishes an undertaking from the bank to make payment/ premature payment of the Fixed Deposit Receipt on demand to the Procuring Entity without requirement of consent of the Bidder concerned. In the event of forfeiture of the Performance Security, the Fixed Deposit shall be forfeited along with interest earned on such Fixed Deposit. vi. The Contractor shall have option to get the Performance Security deposited by deduction from his each running and final bill (Payment Certificate) @ 10% of the amount of the bill.
Additional Performance Security	4.3.2	<ul style="list-style-type: none"> i. If the Bid, which results in the lowest evaluated bid price, is seriously imbalanced or front loaded in the opinion of the Procuring Entity, the Procuring Entity may require the Bidder to produce detailed price analysis for any or all items of the Bill of Quantities to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analysis, taking into consideration the schedule of estimated Contract payments, the Procuring Entity may require that the amount of the performance security be

		<p>increased (to a maximum of 20% of the bid value of such items) at the expense of the Bidder to a level sufficient to protect the Procuring Entity against financial loss in the event of default by the successful Bidder under the Contract.</p> <p>ii. Without limitation to the provisions of the rest of this Sub-Clause, whenever the Engineer-in-charge determines an addition to the Contract Price as a result of a change in Cost, or as a result of a Variation of the Contract Price, the Contractor shall at the Engineer-in-charge's request promptly increase the Performance security to a level of 10 percent of the increased Contract Price.</p>
	<p>4.3.3</p>	<p>The proceeds of the Performance Security shall be forfeited and shall be payable as compensation to the Procuring Entity on happening of any of the events mentioned below:</p> <ul style="list-style-type: none"> i. when the Contractor does not execute the agreement within the specified time; after issue of letter of acceptance/ placement of work order; or ii. when the Contractor fails to commence the work within the time specified; or iii. when the Contractor fails to complete the work satisfactorily within the time specified; or iv. when any terms and conditions of the contract is breached; or v. Failure by the Contractor to pay the Procuring Entity any amount due, either as agreed by the Contractor or determined under any of the Sub-Clauses of these Conditions or another agreement, within 30 Days of the service of notice to this effect by Engineer-in-Charge; or vi. if the Contractor breaches any provision of the Code of Integrity prescribed for Bidders specified in the Act, the Rules, ITB Sub-Clause 1.3 and Sub-Clause 4.2.1 of these conditions. <p>Notice of reasonable time will be given in case of forfeiture of Performance Security. The decision of the Procuring Entity in this regard shall be final.</p>
	<p>4.3.4</p>	<p>The Contractor shall ensure that the Performance Security remains valid upto a period 60 days beyond fulfillment of all the obligations of the Contractor under the Contract, including defect liability and maintenance, if any. If the terms of the Performance Security specify its expiry date, and the Contractor has not become entitled to receive the Performance Certificate by the date 28 Days prior to the expiry date as provided in the Contract, the Contractor shall get extended the validity of the Performance Security.</p> <p>Failure by the Contractor to extend the validity of the Performance security as described herein above, in which</p>

		event the Engineer-in-charge may claim the full amount of the performance security.
	4.3.5	<p>The Procuring Entity shall return the Performance Security or release the Performance Security Declaration to the Contractor as below after completion of all obligations under the Contract, more specifically, after the expiry of the period as specified below:</p> <ol style="list-style-type: none"> i. In case of contracts relating to hiring of trucks and other T&P, transportation including loading, unloading of materials, the amount of Performance Security will be refundable along with the final bill. ii. Ordinary repairs: 3 months after the completion of the Works, provided the final bill has been paid. iii. Original Works / Special Repair Works: Performance Security will be refunded six months after completion, or after expiry of one full rainy season, or after expiry of defect liability period and maintenance period, if any specified in the Contract Data, whichever is later, provided the final bill has been paid. iv. In case of supply of materials: after 3 months of completion of supply, provided the final bill has been paid. v. In case of PWD original Works/ Special Repair Works costing more than Rupees 100 lakh, partial amount of Performance Security will be refunded during the defect liability @ 10% of the Performance Security amount after the lapse of one year of completion and thereafter 10% of original amount of Performance Security at the end of each subsequent year. The remaining amount of Performance Security will be refunded after the satisfactory expiry of the defect liability period.
	4.3.6	In the event of the Contract being determined or rescinded under any of the provisions of Sub-Clause 16.1, the Performance Security shall stand forfeited in full and shall be absolutely at the disposal of the Procuring Entity.
	4.3.7	For works for which a maintenance period of 3-5 years is also specified in addition to the defect liability period. The regular maintenance shall be a part of the BOQ of the Contract as a lump sum amount per annum to be paid on quarterly basis. Necessary price escalation as per provisions in the Contract shall also be payable for years subsequent to the expiry of the Defect Liability Period.
Commencement of Work at the earliest. Record the commencement	4.4	The Contractor shall commence the Works after signing of the Contract within the period as specified in the Special Conditions of the Contract. In case the Contractor does not commence the works within the above period, the Engineer-in-charge shall issue a notice after the expiry of

<p>t or start date.</p>		<p>the said period. The actual date of commencement shall be duly recorded by the Engineer-in-Charge.</p>
<p>Contractor's Representative</p>	<p>4.5</p>	<p>Contractor shall appoint the Contractor's Representative and shall give him all authority necessary to act on the Contractor's behalf under the Contract.</p> <p>Unless the Contractor's Representative is named in the Contract, the Contractor shall, prior to the Commencement Date, submit to the Engineer-in-charge for consent the name and particulars of the person the Contractor proposes to appoint as Contractor's Representative. If consent is withheld or subsequently revoked in terms of this Sub-Clause, or if the appointed person fails to act as Contractor's Representative, or conducts improperly at the Site, the Contractor shall submit the name and particulars of another suitable person for such appointment. The former representative shall be removed within 24 hours of such notice by the Engineer-in-charge.</p> <p>The Contractor shall not, except if the representative has lost the confidence of the Contractor or is not complying to the instructions of the Engineer-in-charge or his assistants, remove without the prior consent of the Engineer-in-charge, revoke the appointment of the Contractor's Representative or appoint a replacement.</p> <p>The whole time of the Contractor's Representative shall be given to directing the Contractor's performance of the Contract. If the Contractor's Representative is to be temporarily absent from the Site during the execution of the Works, a suitable replacement person shall be appointed, subject to the Engineer-in-charge's prior consent, and the Engineer-in-charge shall be notified accordingly. The Contractor's Representative shall, on behalf of the Contractor, receive instructions under Sub-Clause 3.3 [Instructions of the Engineer-in-charge] and comply to them.</p> <p>The Contractor's Representative may delegate any powers, functions and authority to any competent person and may at any time revoke the delegation. Any delegation or revocation shall not take effect until the Engineer-in-charge has received prior notice signed by the Contractor's Representative, naming the person and specifying the powers, functions and authority being delegated or revoked. The Contractor's Representative shall be fluent in the language for communications defined in Sub-Clause 1.4. If the Contractor's Representative's delegates are not fluent in the said language, the Contractor shall make competent interpreters available during all working hours in a number deemed sufficient by</p>

		the Engineer-in-charge.
Sub-Contractor, nominated Sub-Contractor.	4.6	<p>The Contractor shall not Sub-let or subcontract the whole/ or even part of the Works without the consent of the Engineer-in-charge. If the Contractor does so, the Contract shall be liable to be terminated under Sub-Clause 16.1[Termination by Procuring Entity]. Details of the capability of such proposed Sub-Contractors (except the nominated Sub-Contractor named by the Engineer-in-charge) shall be approved by the Engineer-in-charge. The Contractor shall be responsible for the misconduct, acts or defaults of any Subcontractor, his agents or employees, as if they were the acts or defaults of the Contractor.</p> <p>Unless otherwise stated:</p> <p>i. the Contractor shall not be required to obtain consent to suppliers solely of materials, or to a subcontract for which the nominated Subcontractor is named in the Contract.</p> <p>ii. the prior consent/ approval of the Engineer-in-charge on capability documents of the sub-contract shall be obtained for proposed Sub-Contractor;</p> <p>iii. the Contractor shall give the Engineer-in-charge not less than 28 Days' notice of the intended date of the commencement of each Sub-Contractor's work, and of the commencement of such work on the Site.</p> <p>The Contractor shall ensure that the requirements imposed on the Contractor regarding Confidentiality as defined in the GCC Sub-Clause 1.16 [Confidential Details] shall apply equally to each nominated Subcontractor / Subcontractor.</p>
Co-Operation	4.7	<p>The Contractor shall, as specified in the Contract or as instructed by the Engineer-in-charge, allow appropriate opportunities for carrying out work to:</p> <ul style="list-style-type: none"> i) the Procuring Entity's Personnel, ii) any other Contractors employed by the Procuring Entity, and iii) the personnel of any legally constituted public authorities, <p>who may be employed in the execution on or near the Site of any work not included in the Contract.</p> <p>Any such instruction shall constitute a Variation if and to the extent that it causes the Contractor to suffer delays and/or to incur Unforeseeable Cost. Services for these personnel and other Contractors may include the use of Contractor's Equipment, Temporary Works or access arrangements which are the responsibility of the Contractor.</p> <p>If, under the Contract, the Procuring Entity is required to give to the Contractor, possession of any foundation, structure, plant or means of access in accordance with Contractor's Documents, the Contractor shall submit such documents to the Engineer-in-charge in the time and</p>

		manner stated in the Specifications.
Safety Procedures at the site of works	4.8.1	<p>The Contractor shall:</p> <ul style="list-style-type: none"> i. prepare and submit for approval by the Engineer-in-charge an auditable safety plan at Site in accordance with relevant Code. The Contractor shall comply with all applicable safety regulations; ii. take care for the safety of all persons entitled to be on the Site; iii use reasonable efforts to keep the Site and Works clear of unnecessary obstruction so as to avoid danger to these persons; iv. provide fencing, lighting, guarding and watching of the works until completion and taking over under Sub-Clause 12.1 [Taking over of Works]; and v. provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and protection of the public and of owners and occupiers of adjacent land. <p>In addition to the provisions of this Contract, the Contractor shall follow the safety code of the Department.</p>
Safety Provisions for labour	4.8.2	<p>In respect of all labour directly or indirectly employed, noncompliance in the work for the performance of the Contractor's part of this Contract, the Contractor shall at his own expense arrange for the safety provisions as per P.W.D. Safety Code framed from time to time and shall at his own expense provide for all facilities in connection therewith. In case the Contractor fails to make arrangement and provide necessary facilities as aforesaid, the Engineer-in-Charge shall be entitled to provide for all such arrangements at the risk and cost of the Contractor plus 15% as agency charges.</p>
Quality Assurance	4.9.1	<p>The Procuring Entity shall have the right to exercise proper Quality Control measures to ensure that the works have been executed as per specifications and have the designed durability. It will be in three tiers:</p> <ul style="list-style-type: none"> i. The first tier being the Contractor's engineers ensuring full compliance to specifications and conforming the same through testing (as per frequencies specified in the BIS, IRC or other relevant codes) on input materials, processes and the output in the field laboratory established by the Contractor at his cost . ii. The second tier shall be the Engineer-in-charge's team conducting such tests to the extent of the specified code frequency at the Contractor's field laboratory or Department/ Organisation's laboratory and comparing the results with those

		<p>carried out by the Contractor's Engineers; and</p> <p>iii. The third tier shall be the 'Third Party Quality Inspections' by the QCI approved / accredited Inspection Bodies as per ISO 17020, or by the Technical Examiner of the Department/ Organisation, where exists. The QCI approved / accredited Inspection Body may be selected through competitive bidding. The third tier shall conduct such tests to the extent of 10% of the specified frequencies duly witnessed by the Contractor's & Procuring Entity's Engineers and providing a final acceptability on the Works costing above Rs 10 crores for buildings and structures and Rs.20 crores for roads, bridges/ flyovers, canals, dams, etc. as specified in the SCC.</p> <p>The Contractor shall provide all assistance to conduct such tests.</p>
	4.9.2	<p>The Contractor shall institute a approved quality assurance plan stating the methodology / responsibility for sampling, testing/ confirmatory testing, testing frequencies, statistical quality controls, observation / report formats, acceptance criteria, issue and resolution of Non Conformance Reports etc. to demonstrate compliance with the requirements of the specifications. The system shall be in accordance with the details stated in the Contract. The Engineer-in-charge shall be entitled to audit any aspect of the system.</p> <p>Details of all procedures and compliance documents shall be submitted to the Engineer-in-charge for information before each design and execution stage is commenced. When any document of a technical nature is issued to the Engineer-in-charge, evidence of the prior acceptance by the Contractor himself shall be apparent on the document itself.</p> <p>Compliance with the quality assurance system shall not relieve the Contractor of any of his duties, obligations or responsibilities under the Contract.</p>
Site Data	4.10.1	<p>The Procuring Entity shall have made available to the Contractor for his information, prior to the Base Date, all relevant data in the Procuring Entity's possession on sub-surface and hydrological conditions at the Site, including environmental aspects. The Procuring Entity shall similarly make available to the Contractor all such data which come into the Procuring Entity's possession after the Base Date. The Contractor shall be responsible for verifying and interpreting all such data. The Procuring Entity shall not be held responsible about the correctness of all such data and the Contractor shall confirm/ verify all such data at his own cost.</p>
	4.10.2	<p>To the extent which was practicable (taking account of Cost and time), the Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and</p>

		<p>other circumstances which may influence or affect the Bid for Works. To the same extent, the Contractor shall be deemed to have inspected and examined the Site, its surroundings, the above data and other available information, and to have been satisfied before submitting the Bid as to all relevant matters, including (without limitation):</p> <ol style="list-style-type: none"> i. the form and nature of the Site, including sub-surface conditions, ii. the hydrological and climatic conditions, iii. the extent and nature of the work and goods necessary for the execution and completion of the Works and the remedying of any Defects, iv. the Laws, procedures and labour practices of India, particularly Rajasthan, and v. the Contractor's requirements for access, accommodation, facilities, personnel, power, transport, water and other services.
Sufficiency of the Contracted Amount	4.11	<p>The Contractor shall be deemed to:</p> <ol style="list-style-type: none"> i. have satisfied himself as to the correctness and sufficiency of the Accepted Contract Amount, and ii. have based the Accepted Contract Amount on the data, interpretations, necessary information, inspections, examinations and satisfaction as to all relevant matters referred to in Sub-Clause 4.10 [Site Data]. <p>Unless otherwise stated in the Contract, the Accepted Contract Amount covers all the Contractor's obligations under the Contract (including those under Provisional Sums, if any) and all things necessary for the proper execution and completion of the Works and the remedying of any Defects.</p>
Unforeseeable Physical Conditions	4.12	<p>In this Sub-Clause, "physical conditions" means natural physical conditions and man-made and other physical obstructions and pollutants, which the Contractor encounters at the Site when executing the Works, including sub-surface and hydrological conditions but excluding climatic conditions.</p> <p>If the Contractor encounters adverse physical conditions which the Procuring Entity considers to have been Unforeseeable, the Contractor shall give notice to the Engineer-in-charge as soon as practicable.</p> <p>This notice shall describe the physical conditions, so that they can be inspected by the Engineer-in-charge, and shall set out the reasons why the Contractor considers them to be Unforeseeable. The Contractor shall continue executing the Works, using such proper and reasonable measures as</p>

		<p>are appropriate for the physical conditions, and shall comply with any instructions which the Engineer-in-charge may give. If an instruction constitutes a Variation, Clause 9 [Deviations, Variations and Adjustments] shall apply.</p> <p>If and to the extent that the Contractor encounters physical conditions which are Unforeseeable, gives such a notice, and suffers delay and/ or incurs Cost due to these conditions, the Contractor shall be entitled subject to notice under Sub-Clause 21.2 [Contractor's Claims] to:</p> <ul style="list-style-type: none"> i. an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.6 [Extension of Time for Completion], and ii. payment of any such Cost, directed to be incurred by the Contractor as approved extra item which shall be included in the Contract Price. <p>Upon receiving such notice and inspecting and/or investigating these physical conditions, the Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine whether and (if so) to what extent these physical conditions were Unforeseeable, and the matters described in sub-paragraphs (i) and (ii) above related to this extent by the Contractor, but the Engineer-in-charge shall not be bound by the Contractor's interpretation of any such evidence.</p> <p>However, before additional Cost is finally agreed or determined under sub-paragraph (ii), the Engineer-in-charge may also review whether other physical conditions in similar parts of the Works (if any) were more favorable than could reasonably have been foreseen when the Contractor submitted the Bid. If and to the extent that these more favorable conditions were encountered, the Engineer-in-charge may proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the reductions in Cost which were due to these conditions, which may be included (as deductions) in the Contract Price and Payment Certificates. However, the net effect of all adjustments under sub-paragraph (ii) and all these reductions, for all the physical conditions encountered in similar parts of the Works, shall not result in a net reduction in the Contract Price.</p>
Right of Way and Facilities	4.13.1	<p>Unless otherwise specified in the Contract the Procuring Entity shall provide access to and possession of the Site including special and/or temporary rights-of-way which are necessary for the Works. The Contractor shall obtain, at his risk and Cost, any additional rights of way or facilities outside the Site which he may require for the purposes of the Works.</p>
	4.13.2	<p>The Contractor shall allow the Engineer-in-charge and any person authorized by the Engineer-in-charge access to the Site, to any place where work in connection with the</p>

		Contract is being carried out or is intended to be carried out and to any place where materials are being collected or stored or plant are being installed/ assembled for the Works. The contractor may satisfy himself regarding site, acquisition of land, approach roads etc.
Avoidance of Interference with public conveniences	4.14	<p>The Contractor shall not interfere unnecessarily or improperly with:</p> <ul style="list-style-type: none"> i. the convenience of the public, or ii. the access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Procuring Entity or of others <p>The Contractor shall indemnify and hold the Procuring Entity harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.</p>
Access Routes to Site	4.15	<p>The Contractor shall be deemed to have been satisfied as to the suitability and availability of access routes to the Site at Base Date. The Contractor shall use reasonable efforts to prevent any road or bridge from being damaged by the Contractor's traffic or by the Contractor's Personnel. These efforts shall include the proper use of appropriate vehicles and routes.</p> <p>Except as otherwise stated in these Conditions:</p> <ul style="list-style-type: none"> i. the Contractor shall (as between the Parties) be responsible for any maintenance which may be required for his use of access routes; ii. the Contractor shall provide all necessary signs or directions along access routes, and shall obtain any permission which may be required from the relevant authorities for his use of routes, signs and directions; iii. the Procuring Entity shall not be responsible for any claims which may arise from the use or otherwise of any access route; iv. the Procuring Entity does not guarantee the suitability or availability of particular access routes; and v. Costs due to non-suitability or non-availability, for the use required by the Contractor, of access routes shall be borne by the Contractor.
Contractor's Equipment	4.16	<p>The Contractor shall be responsible for all Contractor's Equipment. When brought on to the Site, Contractor's Equipment shall be deemed to be exclusively intended for the execution of the Works. The Contractor shall not remove from the Site any major items of Contractor's Equipment without the consent of the Engineer-in-Charge. However, consent shall not be required for vehicles transporting Goods or Contractor's Personnel off Site.</p>
Protection of	4.17	<p>The Contractor shall take all reasonable steps to protect the</p>

<p>the Environment</p>		<p>environment (both on and off the Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations.</p> <p>The Contractor shall ensure that emissions, surface discharges and effluent from the Contractor's activities shall not exceed the values stated in the Specifications or prescribed by applicable Laws.</p> <p>The Contractor shall, throughout the execution and completion of the Works and the remedying of any Defects therein:</p> <ul style="list-style-type: none"> i. have full regard for the safety of all persons entitled to be upon the Site and keep the Site (so far as the same is under his control) and the Works (so far as the same are not completed or occupied by the Procuring Entity) in an orderly state appropriate to the avoidance of danger to such persons; and ii. provide and maintain at his own Cost all lights, guards, fencing, warning signs and watchmen and other things necessary or required by the Engineer-in-charge or by any duly constituted authority, for the protection of the Works or for the safety and convenience of the public or others.
<p>Electricity, Water and Gas</p>	<p>4.18</p>	<p>The Contractor shall, except as stated below, be responsible for the provision of all power, water and other services he may require for his construction activities and to the extent defined in the Specifications, for the tests.</p> <p>The Contractor shall be entitled to use for the purposes of the Works such supplies of electricity, suitable water, gas and other services as may be available on the Site with due permission of the service provider, on payment of billing value. The Contractor shall, at his risk and cost, provide any apparatus necessary for his use of these services and for measuring / paying for the quantities consumed.</p> <p>The quantities consumed and the amounts due for such services shall be agreed or determined by the Engineer-in-Charge in accordance with Sub-Clause 2.5 [Procuring Entity's Claims] and Sub-Clause 3.5 [Determinations]. The Contractor shall pay these amounts to the Procuring Entity /service provider.</p>
<p>Issue of Procuring Entity's Equipments and Materials</p> <p><i>(Not applicable in case of Lump</i></p>	<p>4.19</p>	<ul style="list-style-type: none"> i. The Procuring Entity may on request issue its machinery and equipment on hire to the Contractor, if available, for the use in the execution of the Works. The hire charges shall be as provided in the Contract Data or on the rates declared by the Procuring Entity in general. <p>The Procuring Entity shall hand over the equipment in good working condition duly confirmed by the Contractor at the time of issue, along with departmental operators, helpers. The Contractor shall be responsible for the proper operation and care of the</p>

Sum Contract)		<p>Procuring Entity's Equipment, POL, washout and ordinary repairs Contractor's operators shall not operate the equipment and the rentals / hire and other charges shall be deposited in advance for every 15 days by the Contractor failing which these shall be recovered from the immediately next Interim payment due to the Contractor.</p> <p>ii. The Procuring Entity may issue materials like cement, steel, etc. (if available) to the Contractor for bonafide use in the Works at the rates specified in the Contract Data or at issue rate plus storage charges or free of cost, if it is a labour rate Contract, at the time and place specified in the Contract. Such materials shall be issued at different stages in quantities calculated for each stage by the Engineer-in-Charge.</p>
Progress Reports	4.20	<p>Unless otherwise stated in the Conditions, monthly progress reports shall be prepared by the Contractor and submitted to the Engineer-in-charge in specified number of copies along with the interim payment certificates, and the updated construction programme on MS Project or similar software for the next month. The first report shall cover the period up to the end of the first calendar month following the Commencement Date. Reports shall be submitted monthly thereafter, each within 7 Days after the last day of the month to which it relates. Reporting shall continue until the Contractor has completed all works which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.</p> <p>Each report shall include:</p> <ul style="list-style-type: none"> i. charts, drawings, outputs and detailed descriptions of progress, including each stage of design (if any) on MS project or similar software, Contractor's Documents, procurement, manufacture, delivery to Site, construction, erection and testing; and including these stages for work by each nominated Subcontractor (as defined in Sub-Clause 5.2 [Nomination of Sub-Contractors]; ii. photographs (in adequate numbers) showing the status of progress of works on the Site; iii the details described in Sub-Clause 6.12 [Records of Contractor's Personnel & Equipment]; iv. copies of quality assurance documents, test results, test certificates of manufactured Materials and action taken on Third Party Quality Inspections by the Contractor; v. list of notices given under Sub-Clause 2.5 [Procuring Entity's Claims] and notices given under Sub-Clause 21.2 [Contractor's Claims]; vi. safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations; and

		vii. comparisons of actual and planned progress, hindrances, with details of any events or circumstances which may jeopardize the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.
Security of the Site and Works	4.21	<p>Unless otherwise stated in the Conditions:</p> <ul style="list-style-type: none"> i. the Contractor shall be responsible for keeping unauthorized persons off the Site, ii. authorized persons shall be limited to the Contractor's Personnel and the Procuring Entity's Personnel; and to any other personnel notified to the Contractor by the Procuring Entity or the Engineer-in-charge, as authorized personnel of the Procuring Entity's other Contractors on the Site. iii. The contractor shall arrange to protect, at his own cost, in an adequate manner, all cut stone work and other work, requiring protection and to maintain such protection as long as work is in progress. He shall remove and replace this protection, as required by the Engineer-in-charge, from time to time. Any damage to the work, so protected, no matter how it may be caused, shall be made good by the Contractor free of cost. All templates, forms. Moulds, centering, false works and models which in the opinion of the Engineer-in-charge are necessary for the proper and workman like execution of the work, shall be provided by the Contractor free of cost. iv. The Contractor shall arrange to keep the site and works secure from manmade disasters, explosions by design or by accident or both at his own cost.
Contractor's Operations on Site	4.22	<p>The Contractor shall confine his operations to the Site, and to any additional areas which may be obtained by the Contractor and agreed to by the Engineer-in-charge as additional working areas. The Contractor shall take all necessary precautions to keep Contractor's Equipment and Contractor's Personnel within the Site and these additional areas, and to keep them off adjacent land.</p> <p>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 and Temporary Works which are no longer required.</p> <p>When the annual repairs and maintenance of Works are carried out, the splashes and droppings from white washing, color washing, painting etc. on walls, floor, windows etc. shall be removed and the surface cleaned simultaneously with the completion of these items of work in the individual rooms, quarters or premises etc. where the work is done without waiting for the actual completion of all the other items of work in the Contract. In case the Contractor fails to comply with the</p>

		<p>requirements of this Sub-Clause, the Engineer-in-Charge shall have the right to get this work done at the Cost of the Contractor either Departmentally or through any other agency. Before taking such action, the Engineer-in-Charge shall give ten Day's notice in writing to the Contractor.</p> <p>Upon the issue of a Taking-Over Certificate, the Contractor shall clear away and remove, from that part of the Site and Works to which the Taking-Over Certificate refers, all Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works. The Contractor shall leave that part of the Site and the Works in a clean and safe condition. However, the Contractor may retain on Site, during the Defects Notification Period, such goods, equipment as are required by the Contractor to fulfill obligations under the Contract.</p>
Fossils/ antiques and articles of value	4.23	<p>All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the Engineer-in-charge / Procuring Entity. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.</p> <p>The Contractor shall, upon discovery of any such finding, promptly give notice to the Engineer-in-charge, who shall issue instructions for dealing with it. If the Contractor suffers delay and/or incurs Cost from complying with the instructions, the Contractor shall give a further notice to the Engineer-in-charge and shall be entitled subject to Sub-Clause 21.2 [Contractor's Claims] to:</p> <ul style="list-style-type: none"> i. an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.6 [Extension of Time for Completion]; and ii. Payment of any such Cost, which shall be included in the Contract Price. After receiving this further notice, the Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.
Completion Plans to be Submitted by the Contractor	4.24	<p>The Contractor shall submit completion drawings, designs within thirty Days of the virtual completion of the Works.</p> <p>In case, the Contractor fails to submit the completion drawings, designs as aforesaid, the Engineer-in-charge shall be authorised to get these as built drawings, designs and other data prepared in 6 copies (4 hard and two soft) at the cost of the Contractor.</p>
Contractor to Supply Tools & Plants etc.	4.25	<p>The Contractor shall provide at his own Cost all materials plant, tools, appliances, implements, ladders, cordage, tackle, scaffolding and Temporary Works required for the proper execution of the Works, whether original, altered or substituted and whether included or not in the Specification or other documents forming part of the Contractor referred to in</p>

		<p>these conditions, or which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer-in- Charge as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with carriage therefore to and from the Works.</p> <p>The Contractor shall also supply without charge the requisite number of persons with the means and materials, necessary for the purpose of setting out Works, and counting, weighing and assisting the measurement for examination at any time and from time to time of the work or Materials. Failing his so doing the same may be provided by the Engineer-in-Charge at the actual Cost +15% as agency charges to the Contractor, under this Contract or otherwise and/ or from his Performance Security or the proceeds of sale thereof, or of a sufficient portion thereof.</p>
Changes in the firm's constitution to be intimated	4.26	<p>Where the Contractor is a partnership firm, the previous approval in writing of the Engineer-in-Charge shall be obtained before any change is made in the constitution of the firm. Where the Contractor is an individual or a Hindu undivided family business concern such approval as aforesaid shall likewise be obtained before the Contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the Works hereby undertaken by the Contractor. If previous approval as aforesaid is not obtained, the Contract shall be deemed to have been subcontracted in contravention of Sub-Clause 4.6 [Sub-Contractor, nominated Sub-Contractor] and the same action may be taken and the same consequences shall ensue as provided in the Sub-Clause 16.1 [Termination by Procuring Entity]</p>
5. Sub-Contractor and Nomination of Sub-Contractor		
Sub Contractor	5.1	<p>A Sub Contractor, if permitted under the Contract, is a firm or a person specified by the Contractor in his Bid along with details of his capabilities on equipment/ machineries, personnel (technical and others), experience on similar works specific to the project, commitment to Quality assurance etc. He should not have been debarred by the Procuring Entity or the State Government.</p>
Nomination of Sub-Contractor	5.2	<p>In the Contract, "nominated Sub-Contractor" means a Sub-Contractor:</p> <p>(a) who is stated in the Contract as being a nominated Sub-contractor, or</p> <p>(b) whom the Engineer-in-charge, instructs the Contractor to employ as a Subcontractor subject to Sub-Clause 5.3 [Objection to Nomination].</p>
Objections to nominations	5.3	<p>The Contractor shall not be under any obligation to employ a nominated Sub-contractor against whom the Contractor</p>

		raises reasonable objection by notice to the Engineer-in-charge as soon as practicable, with supporting particulars.
Payment to Nominated Sub-Contractor	5.4	The Contractor shall pay to the Nominated Sub-Contractors the amounts shown on the Nominated Sub-contractor's invoices approved by the Contractor which the Engineer-in-charge certifies to be due in accordance with the sub-contract. These amounts plus other charges paid to the Nominated Sub-Contractor shall be included in the Contract Price in accordance with Sub-Clause 9.6 [Provisional Sums].
Evidence of payments	5.5	<p>Before issuing a Payment Certificate which includes an amount payable to a nominated Subcontractor, the Engineer-in-Charge may request the Contractor to supply reasonable evidence that the nominated Subcontractor has received all amounts due in accordance with previous Payment Certificates, less applicable deductions for retention or otherwise. Unless the Contractor:</p> <ul style="list-style-type: none"> (a) submits this reasonable evidence to the Engineer-in-Charge, or (b) (i) satisfies the Engineer-in-Charge in writing that the Contractor is reasonably entitled to withhold or refuse to pay these amounts, and (ii) submits to the Engineer-in-Charge reasonable evidence that the nominated Subcontractor has been notified of the Contractor's entitlement, then the Procuring Entity may (at his sole discretion) pay, direct to the nominated Subcontractor, part or all of such amounts previously certified (less applicable deductions) as are due to the nominated Subcontractor and for which the Contractor has failed to submit the evidence described in sub-paragraphs (a) or (b) above. The Contractor shall then repay, to the Procuring Entity, the amount which the nominated Subcontractor was directly paid by the Procuring Entity.
6. Engagement of Staff and Labour by the Contractor		
Staff and Labour	6.1	<ul style="list-style-type: none"> i. Except as otherwise stated in the Specifications, the Contractor shall make arrangements for the engagement of all staff and labour, local or otherwise, and for their payment, water, power, healthcare backup, transport and, when appropriate, housing. ii. The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labour with appropriate qualifications and experience from sources within India. iii. No Engineer of gazetted rank or other gazetted officer employed in Engineering or administrative duties in an Engineering Department of the Government of Rajasthan shall work as a Contractor or employee of a Contractor for

		a period of two years after his retirement from Government service without the previous permission of State Government in writing. The Contract is liable to be cancelled if either the Contractor or any of his employees is found at any time to be such a person who had not obtained said permission prior to engagement in the Contractor's service, as the case may be.
Bidder barred from bidding if near Relatives working in Procuring Entity's office	6.2	<p>The Contractor shall not be permitted to bid for works of a Procuring Entity in which his near relative is an employee. He shall also not have a person as his employee who is a near relative of an employee of the Procuring Entity. Any breach of this condition by the Contractor shall be considered as breach of Code of Integrity and shall render him liable to action under Section 11(3) of the Act which includes exclusion of his Bid from procurement process, forfeiture of Bid Security, Performance Security or any other security or bond relating to procurement, recovery of payments made, if any, along with interest at bank rate, cancellation of the Contract, if already made, debarment from future bidding for a period upto three years, etc.</p> <p>Note: By the term 'near relative' is meant wife, husband, parents and grand- parents, children and grand- children, brothers and sisters, uncles and cousins and their corresponding in- laws.</p>
Employment of Technical Staff and other Employees	6.3.1	The Contractor shall Engage technical personnel as per list provided for in the Contract and provide all necessary superintendence during execution of the Works and as long thereafter as may be necessary for proper fulfilling of the obligations under the Contract. The project manager of the Contractor shall be his principal technical representative. Other personnel shall be engaged as specified in the qualification criteria.
	6.3.2	<p>The technical staff should always be available at site whenever required by Engineer- in- charge to take instructions.</p> <p>The Contractor shall comply with the provisions of the Apprenticeship Act, 1961, and the Rules and Orders issued, thereunder, from time to time. If he fails to do so, his failure will be a breach of Contract. The Contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.</p>
Responsibility of the Technical Staff and employees	6.4	Technical officers/ staff deployed by the Contractor at any construction Site will be responsible for proper quality of Works and physical targeted progress of the Works.

<p>Rate of Wages and Conditions of Labour</p>	<p>6.5</p>	<p>The Contractor shall not pay less than fair wages/ minimum wages to labourers engaged by him on the Works as revised from time to time by the State Government, but the Procuring Entity shall not be liable to pay anything extra for it except as stipulated in price escalation Sub-Clause of the agreement.</p> <p>Explanation: “Fair Wage” means minimum wages for time or piece work, fixed or revised, by the State Government under the Minimum Wages Act, 1948.</p> <p>The Contractor shall, notwithstanding the provisions of any contract to the contrary, cause to be paid fair wages to labourers directly or indirectly engaged on the Works, including any labour engaged by his Sub-Contractors in connection with the said Works as if the labourers have been immediately or directly employed by him.</p> <p>In respect of all labourers, immediately or directly employed on the Works, for the purpose of Contractor’s part of this agreement, the Contractor shall comply with or cause to be complied with the Public Works Department Contractor’s Labour Regulations made, or that maybe made by the State Government from time to time in Regard to payment of wages, wage period, deductions from wages, recovery of wages not paid, and unauthorized deductions, maintenance of wages register, wage card, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and other matters of a like nature.</p> <p>The Engineer-in-charge shall have the right to deduct from the money due to the Contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers, by reasons of non-fulfillment of the conditions of the Contract, for the benefit of the worker or the workers, non-payment of wages or of deductions made therefrom, which are not justified by the terms of the Contract, or as a result of non-observance of the aforesaid regulations.</p> <p>Vis-à-vis the State Government of Rajasthan, the Contractor shall be primarily liable for all payments to be made and for the observance of the regulations aforesaid, without prejudice to his right to claim indemnity from his Sub-Contractors.</p> <p>The regulations, aforesaid, shall be deemed to be part of this Contract and any breach, thereof, shall be deemed to be breach of the Contract.</p>
<p>Contractor not to engage staff of Procuring Entity</p>	<p>6.6</p>	<p>The Contractor shall not recruit, or attempt to recruit, full time (on leave) or part time the staff and labour from amongst the Procuring Entity’s Personnel in any capacity.</p>
<p>Working Hours</p>	<p>6.7</p>	<p>No work shall be carried out on the Site on locally recognized Days of rest, or outside the normal working hours stated in the Contract Data, unless:</p> <ul style="list-style-type: none"> i otherwise stated in the Contract, ii. the Engineer-in-charge gives consent, or

		<p>iii the work is unavoidable, or necessary for the protection of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer-in-charge.</p>
Facilities for Staff and Labour	6.8	<p>Except as otherwise stated in the Specifications, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel. The Contractor shall also provide work site facilities for the Procuring Entity's Personnel as stated in the Specifications.</p> <p>The Contractor shall not permit any of the Contractor's Personnel to maintain any temporary or permanent living quarters within the structures forming part of the Permanent Works.</p>
Health Safety &	6.9	<p>The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel. In collaboration with local health authorities, the Contractor shall ensure that medical staff, first aid facilities, sick bay, doctor at call and ambulance service are available at all times at the Site and at any accommodation for Contractor's and Procuring Entity's Personnel, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.</p> <p>The Contractor shall appoint a safety officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified and trained for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the execution of the Works, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.</p> <p>The Contractor shall send, to the Engineer-in-charge, details of any accident occurred at the Site or to or due to the Works, as soon as practicable after its occurrence. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Engineer-in-charge may reasonably require.</p>
Contractor's Superintendence	6.10	<p>Throughout the execution of the Works, and as long thereafter as is necessary to fulfill the Contractor's obligations, the Contractor shall provide all necessary superintendence to plan, arrange, direct, manage, inspect and test the Works.</p> <p>Superintendence shall be given by a sufficient number of persons having adequate knowledge of the language for communications (defined in Sub-Clause 1.4 [Law and Language] and of the operations to be carried out (including</p>

		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.
Contractor's Personnel	6.11	<p>Contractor's Personnel shall be appropriately qualified, skilled and experienced in respective trades or occupations. The Engineer- in-charge may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative, if applicable, who:</p> <ul style="list-style-type: none"> i. persists in any misconduct or lack of care, ii carries out duties incompetently or negligently, iii. fails to conform with any provisions of the Contract, or iv. Persists in any conduct which is prejudicial to safety, health, or the protection of the environment. <p>If appropriate, the Contractor shall then appoint (or cause to be appointed) a suitable replacement person.</p>
Records of Contractor's personnel and Equipment	6.12	The Contractor shall provide all required equipment, machinery at the Site and submit to the Engineer-in-charge, details showing the number of each category of Contractor's Personnel and of each type of Contractor's Equipment on the Site. Details shall be submitted each calendar month, in a form approved by the Engineer-in-charge, until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.
Disorderly Conduct	6.13	The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst the Contractor's Personnel, and to preserve peace and protection of persons and property on and near the Site.
Foreign Personnel	6.14	<p>Is permitted, the Contractor may bring in to the Country any foreign personnel who are necessary for the execution of the Works to the extent allowed by the applicable Laws. The Contractor shall ensure that these personnel are provided with the required residence visas and work permits. The Procuring Entity will, if requested by the Contractor, use his best endeavors in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national, or Government permission required for bringing in the Contractor's personnel.</p> <p>The Contractor shall be responsible for the return of these personnel to the place where they were recruited or to their</p>

		domicile. In the event of the death in the Country of any of these personnel or members of their families, the Contractor shall similarly be responsible for making the appropriate arrangements for their return or burial.
Supply of Food Stuff	6.15	The Contractor shall arrange for the provision of a sufficient supply of suitable food stuff as may be stated in the Specification at reasonable prices for the Contractor's Personnel for the purposes of or in connection with the Contract.
Supply of Water	6.16	The Contractor shall, having regard to local conditions, provide at his cost on the Site an adequate supply of potable drinking and other water for use in construction and for use of the Contractor's Personnel.
Measures against Insect and Pest Nuisance	6.17	The Contractor shall at all times take the necessary precautions to protect the Contractor's Personnel employed on the Site from insect and pest nuisance, and to reduce their danger to health. The Contractor shall comply with all the regulations of the local health authorities, including use of appropriate insecticide.
Alcoholic Liquor or Drugs	6.18	The Contractor shall not, otherwise than in accordance with the Laws of the Country, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter or disposal thereto by Contractor's Personnel. He shall also not allow the consumption of such Alcoholic Liquor/Drugs at Site during working hours.
Arms and Ammunition	6.19	The Contractor shall not give, barter, or otherwise dispose of, to any person, any arms or ammunition of any kind, or allow Contractor's Personnel to do so.
No unlicensed storage of Explosives and POL	6.20	The Contractor is not authorised to store explosives and POL or other inflammable materials without a valid license from the competent legal authority.
Prohibition of Forced or Compulsory labour	6.21	The Contractor shall not employ forced or compulsory labour, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty, and includes any kind of involuntary or compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements.
Prohibition of Child Labour	6.22	The Contractor shall comply with the provisions of Acts and rules pertaining to prohibition of employment of child labour including not employing any child to perform any work that is economically exploitative, or is likely to be hazardous to, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development.

Festivals and Religious Customs	6.23	The Contractor shall respect the Country's recognized festivals, days of rest and religious or other customs.
Employment Records of Workers	6.24	The Contractor shall keep complete and accurate records of the employment of labour at the Site. The records shall include the names, ages, genders, hours worked and wages paid to all workers. These records shall be summarized on a monthly basis and submitted to the Engineer-in-charge, and these records shall be available for inspection by Auditors / labour inspectors and others as per law during normal working hours. These records shall be included in the details to be submitted by the Contractor under Sub-Clause 6.12 [Records of Contractor's Personnel and Equipment].
Compliance with Labour Laws	6.25	<p>The Contractor shall comply with all the relevant labour Laws applicable to the Contractor's Personnel, including Laws relating to their employment, health, safety, welfare, immigration and emigration, and shall allow them all their legal rights. The Contractor shall require his employees to obey all applicable Laws, including those concerning safety at work.</p> <p>The Contractor shall obtain a valid license under the State Labour Act, and the Contract Labour (Regulation and Abolition) Central Rules 1961, before the commencement of the Works, and continue to have a valid license until the completion of the Works. The Contractor shall also abide by the provisions of the Child Labour (Prohibition and Regulation) Act, 1986.</p> <p>The Contractor shall also comply with the provisions of the Building and Other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996 and the Building and Other Construction Workers Welfare Cess Act, 1996.</p>
Payment of Wages	6.26	<p>i. The Contractor shall pay to labour employed by him either directly or through Sub-Contractors, wages not less than fair wages as defined in P.W.D. Contractor's Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act 1970 and the Contract Labour (Regulation and Abolition) Central Rules, 1971, where applicable.</p> <p>ii. The Contractor shall, notwithstanding the provisions of any Contract to the contrary, cause to be paid for wages to labour indirectly engaged on the Works including any labour engaged by his sub-Contractors in connection with the said Works, as if the labour had been immediately employed by him.</p>
Penalty for non-compliance	6.27	i. In respect of all labour directly or indirectly employed in the Works of performance of the Contractor's Part of this Contract, the contractor shall comply with or cause to be

<p>with labour Laws</p>	<p>complied with the Public Works Department Contractor's Labour Regulations made by the Government from time to time in regard to payment of wages, wage period, deductions from wages, recovery of wages not paid and deductions unauthorisedly made, maintenance of wage books or wage slips, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature as per the Provisions of Contract Labour (Regulation & Abolition) Act, 1970, and the Contract Labour (Regulation & Abolition) Central Rules,1971, wherever applicable.</p> <p>ii. The Engineer-in-Charge concerned shall have the right to deduct from the moneys due to the Contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the Contract for the benefit of the workers, non-payment of wages or of deductions, made from his or their wages which are not justified by their terms of the Contract or non-observance of the Regulations.</p> <p>iii. Under the provision of Minimum Wages (Central) Rules 1950, the Contractor is bound to allow to the labour directly or indirectly employed in the Works one day rest for 6 Days continuous work and pay wages at same rate as for duty. In the event of default the Engineer-in-Charge shall have the right to deduct the sum or sums not paid on account of wages for weekly holidays to any labour and pay the same to the persons entitled thereto from any money due to the Contractor by the Engineer-in-Charge concerned.</p> <p>iv. The Contractor shall comply with the provisions of the Payment of Wages Act, 1936, Minimum Wages Act, 1948, Employees Liability Act, 1938, Workmen's Compensation Act, 1923, industrial Disputes Act, 1947, Maternity Act, 1970, or the modifications thereof or any other relevant Labour Laws and the rules made thereunder from time to time.</p> <p>v. The Contractor shall indemnify and keep indemnified the State Government/ Procuring Entity against payments to be made under and for the observance of the Laws aforesaid and the P.W.D. Contractor's Labour Regulations without prejudice to his right to claim indemnity from his Sub-Contractors.</p> <p>vi. The Laws aforesaid shall be deemed to be a part of this Contract and any breach thereof shall be deemed to be a breach of this Contract.</p> <p>vii. Whatever is the minimum wage for the time being, or if the wage payable higher than the minimum wage, such wage shall be paid by the Contractor to the workmen directly without the intervention of Jamadar and that Jamadar shall not be entitled to deduct or recover any</p>
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		amount from the minimum wage payable to the workmen as and by way of commission or otherwise. The Contractor shall ensure that no amount by way of commission or otherwise is deducted or recovered by the Jamadar from the wage of workmen.
7. Execution of works and workmanship		
Manner of Execution	7.1	<p>The Contractor shall carry out works, the production of mixes, the procurement of input materials, and all other execution of the Works:</p> <ul style="list-style-type: none"> i. in the manner (if any) specified in the Contract, ii. in a proper workman like and careful manner, in accordance with recognized good practices, and iii. with properly equipped facilities and non-hazardous materials, except as otherwise specified in the Contract.
Samples	7.2	<p>The Contractor shall submit the following samples of Materials, and relevant information, to the Engineer-in-charge for consent prior to using the Materials in or for the Works:</p> <ul style="list-style-type: none"> i. Contractor's standard samples of raw/ produced Materials and samples specified in the Contract, all at the Contractor's Cost, and ii. additional samples instructed by the Engineer-in-Charge as a Variation. <p>Each sample shall be labeled as to origin and intended use in the Works.</p> <p>Samples shall also be collected by the Quality testing/inspection teams from the works in progress and the Contractor shall willingly cooperate with such quality assurance procedures.</p>
Inspection	7.3	<p>The Procuring Entity's Personnel shall at all reasonable times:</p> <ul style="list-style-type: none"> i. have full access to all parts of the Site and to all places from which natural materials are being obtained, and ii. during production, manufacture and construction (at the Site and elsewhere), be entitled to examine, inspect, measure and test the materials and workmanship, and to check the progress of manufacture of Plant and production and manufacture of materials. <p>The Contractor shall give the Procuring Entity's Personnel full opportunity to carry out these activities, including providing access, facilities, permissions and safety equipment. No such activity shall relieve the Contractor from any obligation or responsibility.</p> <p>The Contractor shall give notice of minimum 07 days to the Engineer-in-charge whenever any work is ready and</p>

		<p>before it is covered up, put out of sight, or packaged for storage or transport, beyond measurement, any work in order that the same may be measured and correct dimensions thereof, be taken before the same is covered up. The Engineer-in-charge shall then either carry out the examination, inspection, measurement or testing without unreasonable delay, or promptly give notice to the Contractor that the Engineer-in-charge does not require to do so. If the Contractor fails to give the notice, he shall, if and when required by the Engineer-in-charge, uncover the work and thereafter reinstate and make good, all at the Contractor's Cost.</p>
<p>Stores supplied by the Procuring Entity</p> <p><i>(Not applicable in case of Lump Sum Contract)</i></p>	<p>7.4</p>	<p>If the specification or estimate of the Works provide for the use of any special description of materials, to be supplied from the Engineer Incharge's stores, or if, it is required that Contractor shall use certain stores to be provided by the Engineer Incharge specified in the Schedule or Memorandum hereto annexed, the Contractor shall be bound to procure and shall be supplied such materials and stores as are, from time to time, required to be used by him for the purpose of the Contract only, and the value of the full quantity of materials and stores, so supplied, at the rates specified in the said Schedule or Memorandum, may be set off or which may be deducted from any sum, then due or thereafter become due, to the Contractor under the Contract or otherwise or against or from the Performance Security or the proceeds of sale, if the same is held in Government securities, the same or a sufficient portion thereof being in this case, sold for this purpose. All materials supplied to the Contractor, either from departmental stores or with the assistance of the Procuring Entity, shall remain the absolute property of the Procuring Entity. The Contractor shall be the trustee of the stores/ materials, so supplied/ procured and these shall not, on any account, be removed from the Site of the Works and shall be, all times, open to inspection by the Engineer Incharge. Any such materials, unused and in perfectly good condition at the time of completion or determination or rescinding of the Contract, shall be returned to the Engineer Incharge's Stores, if, by a notice in writing under his hand, he shall so require, and if on service of such notice, the Contractor fails to return the materials, so required, he shall be liable to pay the price of such materials. But the Contractor shall not be entitled to return any such materials, unless with such consent, and shall have no claim for compensation on account of any such materials, so supplied to him as aforesaid being unused by him, or for any wastage in or damage to any such materials. For the stores returned by the Contractor, he shall be paid for, at the price originally charged excluding storage charges, in case of materials supplied from departmental stores and actual cost including freight, cartage, taxes etc., paid by the Contractor, in case of supplies received with the assistance of the Procuring Entity, however, should in no case exceed market rate</p>

		prevailing at the time the materials are taken back. The decision of the Engineer Incharge, as to the price of the stores returned, keeping in view its condition etc., shall be final and conclusive. In the event of breach of the aforesaid condition, the Contractor shall, in addition to throwing himself open to account for contravention of the terms of the license or permit and/or for criminal breach of trust, pay to the Procuring Entity, all advantages or profits resulting or which in the usual course, would result to him by reason of such breach. Provided that the Contractor shall, in no case be entitled to any compensation or damage on account of any delay in supply, or non-supply thereof, all or any such materials and stores.
Penal rate in case of excess consumption <i>(Not applicable in case of Lump Sum Contract)</i>	7.5	The Contractor shall return the materials issued free of cost to him and found surplus after its intended consumption in the Works, immediately. The Contractor shall be charged for the materials which were not returned or consumed in excess of the requirements calculated on the basis of standard consumption approved by the Procuring Entity, at double of the issue rate including storage and supervision charges or market rate, whichever is higher. A Materials Supply and Consumption Statement, in prescribed Form RPWA 35A, shall be submitted with every Payment Certificate, distinguishing materials supplied by the Procuring Entity and materials procured by the Contractor himself. The recovery for such materials shall be made from Payment Certificate next after the consumption and shall not be deferred. Certificate of such nature shall be given in each Payment Certificate.
Hire of Plant and Machinery	7.6	Plant and Machinery, required for execution of the Works, may be issued to the Contractor, if available, on the rates of hire charges and other terms and conditions as per the departmental/ Organisation Rules, as per Schedule annexed to these conditions. Rates of such Plant & Machinery shall be got revised periodically so as to bring them at par with market rate.
Imported Store articles to be obtained from the Procuring Entity <i>(Not applicable in case of Lump Sum Contract)</i>	7.7	The Contractor shall obtain from the stores of the Engineer-in-charge, all imported store articles, which may be required for the Works or any part thereof, or in making up articles required thereof, or in connection therewith, unless he has obtained permission, in writing, from the Engineer Incharge. to obtain such stores and articles from elsewhere. The value of such stores and articles, as may be supplied to the Contractor by the Engineer Incharge, will be debited to the Contractor, in his account, at the rates shown in the Schedule attached to the Contract, and if they are not entered in the Schedule, they will be debited at cost price, which for the purposes of this Contract, shall include the cost of carriage and all other expenses, whatsoever, which shall have been incurred in obtaining delivery of the same at the stores aforesaid plus storage charges.

<p>Materials Supplied by the Contractor</p>	<p>7.8</p>	<p>The Contractor shall, at his own expense, provide all materials conforming to the specifications from the sources approved by the Engineer-In-Charge, required for the Works other than those, which are stipulated, to be supplied by the Procuring Entity.</p> <p>Samples for all such materials shall be collected by the Contractor and tested in the presence of representative of the Engineer-in-Charge, at the field laboratory established by the Contractor at the site. Tests which cannot be carried out at the field laboratory, shall be got tested at an NABL accredited laboratory, or any ISI approved laboratory or a Government /Departmental laboratory approved by the Engineer-in-Charge. Only materials so approved shall be used in the works and any change of materials shall be similarly got approved again. Works constructed/executed with unapproved materials shall be summarily rejected without any further investigation or testing.</p> <p>The Contractor shall not be eligible for any claim or compensation either arising out of any delay in the work or due to any corrective measures required to be taken on account of and as a result of testing of materials.</p> <p>The Engineer-in-Charge shall have full powers to require the removal from the premises, of all materials which in his opinion are not in accordance with the Specifications and in case of default the Engineer-in-Charge shall be at liberty to employ at the expense of the Contractor, other persons to remove the same without being answerable or accountable for any loss for damage that may happen or arise to such Materials. The Engineer-in-Charge shall also have full powers to require other proper Materials to be substituted thereof and in case of default the Engineer-in-charge may cause the same to be supplied from other suitable sources and all Costs which may be incurred for such removal and substitution shall be borne by the Contractor.</p>
<p>Testing</p>	<p>7.9.1</p>	<p>This Sub-Clause shall apply to all tests specified in the Contract, other than the Tests after Completion (if any).</p> <p>Except as otherwise specified in the Contract, the Contractor shall provide a field laboratory with all apparatus, assistance, documents and other information, electricity, equipment, fuel, consumables, instruments, labour, materials, and suitably qualified and experienced staff, as are necessary to carry out the specified tests efficiently. The Contractor shall agree, with the Engineer-in-charge, the time and place for the specified testing of any Plant, Materials and other parts of the Works.</p> <p>The Engineer-in-charge may, under Sub-Clause 9.2.1 [Deviations/ Variations, Extent and Pricing], vary the location or details of specified tests, or instruct the Contractor to carry out additional tests. If these varied or additional tests show that the tested Plant, Materials or</p>

		<p>works or workmanship is not in accordance with the Contract, the Cost of carrying out this variation shall be borne by the Contractor, notwithstanding other provisions of the Contract.</p> <p>The Engineer-in-charge shall give the Contractor not less than 24 hours' notice of the Engineer-in-charge's intention to attend the tests. If the Engineer-in-charge does not attend at the time and place agreed, he may designate a qualified and authorised person to attend the testing, if not, the Contractor may approach the Procuring Entity for deputing an Engineer / any other experienced person to witness the tests. In no case shall the tests be conducted without an Engineer/competent person representing the Procuring Entity.</p>
	7.9.2	<p>If the Contractor suffers delay and/or incurs Cost from complying with these instructions or as a result of a delay for which the Procuring Entity is responsible, the Contractor shall give notice to the Engineer-in-charge and shall be entitled subject to Sub-Clause 21.2 [Contractor's Claims] to:</p> <ul style="list-style-type: none"> i. an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.6 [Extension of Time for Completion], and ii. payment of any such Cost, which shall be included in the Contract Price. <p>After receiving this notice, the Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters</p> <p>The Contractor shall promptly forward to the Engineer-in-charge, duly certified reports of the tests. When the specified tests have been passed, the Engineer- in-charge shall endorse the Contractor's test certificate.</p>
Cost of Samples	7.10	All samples shall be supplied by the Contractor at his own Cost if the supply thereof is clearly intended by or provided for in the Contract.
Cost of Tests	7.11	<p>The Cost of conducting any test shall be borne by the Contractor if such test is:</p> <ul style="list-style-type: none"> i. clearly intended by or provided for in the Contract, or ii. particularised in the Contract (In case only of a test under load or of a test to ascertain whether the design of any finished or partially finished work is appropriate for the purposes for which it was intended to fulfill) in sufficient detail to enable the Contractor to price or allow for the same in his Bid.
Cost of Tests not provided for	7.12	<p>If any test required by the Engineer-in-charge which is:</p> <ul style="list-style-type: none"> i. not so intended by or provided for in the Contract or codes;

		<p>ii. (in the cases above mentioned) not so particularized, or</p> <p>iii. (though so intended or provided for),</p> <p>if required by the Engineer-in-charge to be carried out at any place other than the Site or the place of manufacture, fabrication or preparation of the Materials or Plant, on test shows the Materials, Plant or work or workmanship not to be in accordance with the provisions of the Contract/ specifications to the satisfaction of the Engineer-in-charge, then the Cost of such test shall be borne by the Contractor, but in any other case Department/ Organisation will bear the Cost.</p>
Rejection	7.13	<p>If, as a result of an examination, inspection, measurement or testing, any Plant, Materials, works or workmanship is found to be defective or otherwise not in accordance with the Contract, the Engineer-in-charge may reject the works, Plant, Materials or workmanship by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the defect and ensure that the reconstructed/ reproduced/ replaced item complies with the Contract.</p> <p>If the Engineer-in-charge requires this Plant, Materials, works, or workmanship to be retested, the tests shall be repeated under the same terms and conditions. If the rejection and retesting cause the Procuring Entity to incur additional Costs, the Contractor shall subject to Sub-Clause 2.5 [Procuring Entity's Claims] pay these Costs to the Procuring Entity.</p>
Remedial Work	7.14	<p>Notwithstanding any previous test or certification, the Engineer-in-charge may instruct the Contractor to:</p> <ul style="list-style-type: none"> i. remove from the Site and replace any works, Plant or Materials which is not in accordance with the Contract, ii. remove and re-execute any other work which is not in accordance with the Contract, and iii. execute any work which is urgently required for the safety of the Works, whether because of an accident, unforeseeable event or otherwise. <p>The Contractor shall comply with the instruction within a reasonable time, which shall be the time (if any) specified in the instruction, or immediately if urgency is specified under sub-paragraph iii.</p> <p>If the Contractor fails to comply with the instruction, the Procuring Entity shall be entitled to employ and pay other persons to carry out the work. Except to the extent that the Contractor would have been entitled to payment for the work, the Contractor shall subject to Sub-Clause 2.5 [Procuring Entity's Claims] pay to the Procuring Entity all Costs arising from this failure.</p>
Ownership of Plant and	7.15	<p>Except as otherwise provided in the Contract, each item of Plant and Materials shall, to the extent consistent with the</p>

Materials		Contract, become the property of the Procuring Entity at whichever is the earlier of the following times, free from liens and other encumbrances: i. when it is incorporated in the Works; ii. when the Contractor is paid the corresponding value of the Plant and Materials under Sub-Clause 8.12 [Payment for Plant and Materials in event of Suspension].
Dismantled Material Government Property	7.16	The Contractor, in course of the Works, should understand that all materials e.g. stone, bricks, steel and other materials obtainable in the Works by dismantling etc. will be considered as the property of the Procuring Entity and will be disposed off to the best advantage of the Procuring Entity, as per directions, of the Engineer-in-charge.
Action where no Specifications are provided.	7.17	In the case of any class of works for which there are no specifications in Bureau of Indian Standards Specifications, Indian Road Congress for road Works and Indian Building Congress for building Works or any Central Government agency, or Departmental Specifications, such works shall be carried out in accordance with the relevant International Standards under the instructions and requirements of the Engineer-in-Charge.
Royalties	7.18	The Contractor shall pay all royalties, rents and other payments for: i. natural Materials obtained from outside the Site, and ii. disposal of materials from demolitions and excavations and of other surplus materials (whether natural or man-made), except to the extent that disposal areas within the Site are specified in the Contract. iii. the liability, if any, on account of quarry fees, royalties, octroi and any other taxes and duties in respect of materials actually consumed on public work shall be borne by the Contractor.
8. Commencement, Delays and Suspension		
Fixing centerlines, reference points and bench marks.	8.1	The basic centerlines, reference points and benchmarks will be fixed by the by the Contractor and checked/confirmed by the Engineer-in-Charge. The Contractor shall establish at his own Cost at suitable points, additional reference lines and benchmarks as may be necessary and instructed by the Engineer-in-Charge. The Contractor shall remain responsible for the sufficiency and accuracy of all the benchmarks and reference lines.
Setting out of works.	8.2	The Contractor shall set out the Works in relation to original points, lines and levels of reference specified in the Contract or notified by the Engineer-in-Charge. The Contractor shall be responsible for the correct positioning of all parts of the Works, and shall rectify any error in the

		<p>positions, levels, dimensions or alignment of the Works.</p> <p>The Procuring Entity shall be responsible for any errors in these specified or notified items of reference, but the Contractor shall use reasonable efforts to verify their accuracy before they are used. If the Contractor suffers delay and/or incurs Cost from executing work which was necessitated by an error in these items of reference, and an experienced contractor could not reasonably have discovered such error and avoided this delay and/ or Cost, the Contractor shall give notice to the Engineer-in-Charge and shall be entitled subject to Sub-Clause 21.2 [Contractor's Claims] to:</p> <ul style="list-style-type: none"> i. an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.6 [Extension of Time for Completion], and ii. payment of any such Cost, which shall be included in the Contract Price. <p>After receiving this notice, the Engineer-in-Charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (a) whether and (if so) to what extent the error could not reasonably have been discovered, and (b) the matters described in sub-paragraphs i and ii above related to this extent.</p>
<p>Commencement of Works</p>	<p>8.3.1</p>	<p>Except otherwise specified in the Contract Data/ Special Conditions of Contract, the Commencement Date shall be the date at which the following precedent conditions have all been fulfilled and the Engineer-in-charge's instruction recording the agreement of both Parties on such fulfillment and instructing to commence the Work is received by the Contractor:</p> <ul style="list-style-type: none"> i. signature of the Contract Agreement (after submission of Performance security and Insurance by the Contractor) by both Parties, and if required, approval of the Contract by relevant authorities; ii. delivery to the Contractor of reasonable evidence of the Procuring Entity's Financial arrangements; iii. except if otherwise specified in the Contract Data, possession of the Site given to the Contractor together with such permission(s) under (a) of Clause 2.1 [Right of Access to the Site] as required for the commencement of the Works; <p>The Contractor shall commence the execution of the Works as soon as is reasonably practicable after the Commencement Date, and shall then proceed with the Works with due expedition and without delay. The date of commencement and stipulated completion shall be entered in the Contract Agreement.</p>
	<p>8.3.2</p>	<p>In case, the work cannot be started within one-fourth time of the stipulated period of completion of the Works due to reasons not within the control of the Contractor as decided</p>

		by the Procuring Entity, either Party may close the Contract. In such eventuality, the Performance Security of the Contractor shall be refunded, but no payment on account of interest, loss of profit or damages etc. shall be payable at all.
Time for Completion	8.4	<p>The Contractor shall complete the whole of the Works, and each Section (if any), within the Time for Completion for the Works or Section (as the case may be), including:</p> <ul style="list-style-type: none"> i. achieving the passing of the Tests on Completion, and ii. Completing all work which is stated in the Contract as being required for the Works or Section to be considered to be completed for the purposes of taking-over under Clause 12 [Taking Over of the Works and Sections]. iii. Completion of as built drawings and a manual for maintenance and operations, if required. iv. Completion of each mile stone as per the current (original updated every month) construction programme. v. Rectification and or reconstruction of all deficient items of work or works /items of works for which 'Non Conformance Reports' were issued. vi. Restoration of the approach roads, fencing and appurtenant works damaged during execution of the Contracted project and clearance of Site.
Construction Programme <i>(Activity Schedule in case of Lump Sum Contract)</i>	8.5	<p>The Contractor shall submit a detailed execution time programme on MS Project or other similar software to the Engineer-in-charge within 28 Days after receiving the notice under Sub-Clause 8.3 [Commencement of Works]. The Contractor shall also submit a revised programme whenever the previous programme is inconsistent with actual progress or with the Contractor's obligations. Each programme shall be revised every month and shall include:</p> <ul style="list-style-type: none"> i. the order in which the Contractor intends to carry out the Works, including the anticipated timing of each stage of design (if any), drawings, Contractor's Documents, procurement, manufacture of Plant, delivery to Site, construction of works, erection and testing, ii. each of these stages for work by each Sub-Contractor/ Nominated Sub-Contractor, iii. the sequence and timing of quality and other inspections and tests specified in the Contract, and iv. a supporting report which includes: <ul style="list-style-type: none"> (a) a general description of the time, methods which the Contractor intends to adopt, and of the major stages, in the execution of the Works, and (b) details showing the Contractor's reasonable estimate of the number of each class of Contractor's Personnel and of each type of Contractor's Equipment,

		<p>required on the Site for each major stage.</p> <p>Unless the Engineer-in-charge, within 21 Days after receiving a programme, gives notice to the Contractor stating the extent to which it does not comply with the Contract, the Contractor shall proceed in accordance with the programme, subject to his other obligations under the Contract. The Procuring Entity's Personnel shall be entitled to rely upon the programme when planning their activities.</p> <p>The Contractor shall promptly give notice to the Engineer-in-charge of specific probable future events or circumstances which may adversely affect the Works, increase the Contract Price or delay the execution of the Works. The Engineer-in-charge may require the Contractor to submit an estimate of the anticipated effect of the future event or circumstances, and/or a proposal under Sub-Clause 9.2 [Deviations/ Variations Extent and Pricing].</p> <p>If, at any time, the Engineer-in-charge gives notice to the Contractor that a programme fails (to the extent stated) to comply with the Contract or to be consistent with actual progress and the Contractor's stated intentions, the Contractor shall submit a revised programme to the Engineer-in-charge in accordance with this Sub-Clause.</p>
<p>Extension of Time for Completion</p>	<p>8.6</p>	<p>The Contractor shall be entitled subject to Sub-Clause 21.2 [Contractor's Claims] to an extension of the Time for Completion if and to the extent that completion for the purposes of Clause 12 [Taking Over of the Works and Sections] is or will be delayed by any of the following causes:</p> <ul style="list-style-type: none"> i. a Variation (unless an adjustment to the Time for Completion has been agreed under Clause 9 [Deviations, Variations and Adjustments] or other substantial change in the quantity/design of an item of work included in the Contract, ii. a cause of delay giving an entitlement to extension of time under a Sub-Clause of these Conditions, iii. exceptionally adverse climatic conditions, excluding the rains, high or low variations in temperatures, iv. Unforeseeable shortages in the availability of personnel or Goods caused by epidemic or Governmental actions, or v. any delay, impediment or prevention caused by or attributable to the Procuring Entity, the Procuring Entity's Personnel, or the Procuring Entity's other Contractors <p>If the Contractor considers himself to be entitled to an extension of the Time for Completion, the Contractor shall give notice to the Engineer-in-charge in accordance with Sub-Clause 21.2 [Contractor's Claims]. When determining each extension of time under Sub-Clause 3.5 [Determinations], the Engineer-in-charge shall review</p>

		previous determinations and may increase, but shall not decrease, the total extension of time.
Delays Caused by Authorities	8.7	<p>If the following conditions apply, namely:</p> <ul style="list-style-type: none"> i. the Contractor has diligently followed the procedures laid down by the relevant legally constituted public authorities in the Country, ii. these authorities delay or disrupt the Contractor's work, and iii. the delay or disruption was Unforeseeable, <p>Then this delay or disruption will be considered as a cause of delay under Sub-Clause 8.6 [Extension of Time for Completion].</p>
Rate of progress of works.	8.8	<p>As soon as possible after the Contract is concluded the Contractor shall submit a time and progress chart (preferably on MS Project or other similar software) for each milestone and get it approved by the Engineer-in-Charge. The chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the work. It shall indicate the forecast of the dates of commencement and completion of various tasks or sections of the work and may be amended as necessary by agreement between the Engineer-in-Charge and Contractor within the limitations of time imposed in the Contract documents, and further to ensure good progress during the execution of the work, the Contractor shall in all cases in which the time allowed for any work, exceeds one month complete the work as per milestone.</p> <p>If, at any time:</p> <ul style="list-style-type: none"> i. actual progress is too slow to complete within the Time for Completion, and/or progress has fallen (or will fall) behind the current programme under Sub-Clause 8.5 [Construction Programme], other than as a result of a cause listed in Sub-Clause 8.6 [Extension of Time for Completion], then the Engineer-in-charge may instruct the Contractor to submit, under Sub-Clause 8.5 [Construction Programme], a revised programme and supporting report describing the revised methods which the Contractor proposes to adopt in order to expedite progress and complete within the Time for Completion. ii Unless the Engineer-in-Charge notifies otherwise, the Contractor shall adopt these revised methods, which may require increases in the working hours and/or in the numbers of Contractor's Personnel and/or Goods, at the risk and Cost of the Contractor. If these revised methods cause the Procuring Entity to incur additional Costs, the Contractor shall subject to notice under Sub-Clause 2.5 [Procuring Entity's Claims] pay these Costs to the Procuring Entity, in addition to delay damages (if any) under Sub-Clause 8.9 below. iii. Additional Costs of revised methods including

		<p>acceleration measures, instructed by the Engineer-in-charge to reduce delays resulting from causes listed under Sub-Clause 8.6 [Extension of Time for Completion] shall be paid by the Procuring Entity, without generating, however, any other additional payment benefit to the Contractor</p> <p>If the progress of the work has fallen so much in arrears as to prevent other contractors on the work from carrying out their part of the work within the stipulated time, he will be liable for the settlement of any claim put in by any of these contractors for the expenses of keeping their labor unemployed to the extent considered reasonable by the Engineer-in-charge.</p>						
<p>Compensation / Damages for Delay (Liquidated Damage)</p> <p><i>(In case of Lump Sum Contract, the liquidated damages shall be linked to Stage wise completion of Works as stated in Activity Schedule and specified in SCC)</i></p>	<p>8.9</p>	<p>a. If the Contractor fails to maintain the required progress in terms of Sub-Clause 8.4 [Extension of Time for Completion] or to complete the Works and clear the Site on or before the original or extended date of completion, he shall, without prejudice to any other right or remedy available under the Law to the Government/ procuring Entity on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the Engineer-in-charge (whose decision in writing shall be final and binding) may decide on the amount of contracted value of the Works for every time span that the progress remains below that specified in Sub-Clause 8.4 [Extension of Time for Completion] or that the Works remains incomplete. This will also apply to items or group of items for which a separate period of completion has been specified.</p> <p>b. To ensure good progress during the execution of Works, the Contractor shall be bound, in all cases in which the time allowed for any Works exceeds one month (save for special jobs or where time spans have been fixed in light of the specific construction programme), to complete 1/8th of the whole of the work before 1/4th of the whole time allowed under the contract has elapsed, 3/8th of the work before 1/2 of such time has elapsed and 3/4th of the work before 3/4 of such time has elapsed. If the Contractor fails to complete the work in accordance with this time schedule in terms of cost in money, and the delay of execution of Works is attributable to the Contractor, the Contractor shall be liable to pay compensation to the Government/ Procuring Entity at every time span as below:-</p> <table border="1"> <tr> <td>A .</td> <td>Time Span of full stipulated period</td> <td>1/4th</td> <td>1/2th</td> <td>3/4th</td> <td>Full</td> </tr> </table>	A .	Time Span of full stipulated period	1/4 th	1/2 th	3/4 th	Full
A .	Time Span of full stipulated period	1/4 th	1/2 th	3/4 th	Full			

B	Work to be completed in terms of money	1/8 th (Rs)	3/8 th (Rs)	3/4 th (Rs)	Full (Rs)
C	Compensation payable by the Contractor for delay attributable to Contractor at the stage of	<p>Delay up to one fourth period of the prescribed time span – 2.5% of the work remained unexecuted.</p> <p>Delay exceeding one fourth of the prescribed time span but not exceeding half of the prescribed time span - 5% of the work remained unexecuted.</p> <p>Delay exceeding half of the prescribed time span but not exceeding three fourth of the prescribed time span - 7.5% of the work remain unexecuted.</p> <p>Delay exceeding three fourth of the prescribed time span – 10% of the work unexecuted.</p>			
<p>Note-1: In case delayed period over a particular time span is split up and is jointly attributable to the Procuring Entity and the Contractor, the competent authority may reduce the compensation in proportion of delay attributable to the Procuring Entity over entire delayed period over that time span after clubbing up the split delays attributable to the Procuring Entity and this reduced compensation would be applicable over the entire delayed period without paying any escalation.</p> <p>Note-2: The compensation, levied as above, shall be recoverable from the Payment Certificate payable after the concerned time span. The total compensation for delays shall, however, not exceed 10 percent of the total value of the Works.</p> <p>c. The Contractor shall further be bound to carry out the work in accordance with the date and quantity entered in the progress statement attached to the Bid.</p> <p>d. However, if a time schedule has been submitted by the Contractor before execution of the agreement, and it is entered in agreement as submitted or as modified by the Procuring Entity or the Engineer-in-Charge, the Contractor shall complete the Works within the said time schedule. In the event of the Contractor failing to comply with the time schedule, he shall be liable to pay compensation as prescribed in foregoing paragraph of this Sub-Clause. While granting extension in time attributable to the Procuring Entity, reasons shall be recorded for each delay.</p>					

		<p>e. The amount of compensation may be adjusted or set off against any sum payable to the Contractor under this or any Contract with the Procuring Entity. In case, the Contractor does not achieve a particular milestone mentioned in Contract Data or the rescheduled milestone(s), the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied at the final grant of extension of time.</p> <p>f. Withholding of this amount on failure to achieve a milestone shall be automatic without any notice to the Contractor. However, if the Contractor catches up with the progress of work on the subsequent milestone(s), the withheld amount shall be released. In case the Contractor fails to make up for the delay in subsequent milestone(s), amount mentioned against each milestone missed subsequent also shall be withheld. However, no interest, whatsoever, shall be payable on such withheld amount.</p> <p>g. If the Contract is completed in the original time period as agreed upon in the Contract, then the Liquidated Damages so imposed for delays of intermediate milestones will be adjusted/ paid. Also, price escalation shall not be applicable if Liquidated Damages have been imposed. However, if the Contractor finishes the work as per the original time period, he shall be eligible to receive the price escalation.</p>
<p>Suspension of Work</p>	<p>8.10.1</p>	<p>The Engineer-in-charge may for recorded reasons, at any time instruct the Contractor to suspend progress of part or all of the Works. During such suspension, the Contractor shall protect, store and secure such part or the Works against any deterioration, loss or damage. The Engineer-in-charge may also notify the cause for the suspension.</p>
	<p>8.10.2</p>	<p>The Contractor shall, on receipt of the order in writing of the Engineer-in-Charge (whose decision shall be final and binding on the Contractor) suspend the progress of the Works or any part thereof for such time and in such manner as the Engineer-in-Charge may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof, for any of the following reasons:</p> <ul style="list-style-type: none"> i. on account of any default on the part of the Contractor; or ii. for proper execution of the Works or part thereof for reasons other than the default of the Contractor; or iii. for safety of the Works or part thereof. <p>The Contractor shall, carry out the instructions given in that behalf by the Engineer-in-Charge.</p>

		If the suspension is ordered for reasons ii and iii above, the Contractor shall be entitled to an extension of time equal to the period of every such suspension for completion of the item or group of items of work for which a separate period of completion is specified in the Contract and of which the suspended work forms a part,
Consequences of Suspension	8.11	<p>If the Contractor suffers delay and/ or incurs Cost from complying with the Engineer-in-charge's instructions under Sub-Clause 8.10 [Suspension of Work] and/ or from resuming the work, the Contractor shall give notice to the Engineer-in-charge and shall be entitled subject to Sub-Clause 21.2 [Contractor's Claims] to:</p> <p>i. An extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.6 [Extension of Time for Completion], and</p> <p>ii. payment of any such Cost, which shall be included in the Contract Price.</p> <p>After receiving this notice, the Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p> <p>The Contractor shall not be entitled to an extension of time for, or to payment of the Cost incurred in making good the consequences of the Contractor's faulty design, workmanship or Materials, or of the Contractor's failure to protect, store or secure the work in accordance with Sub-Clause 8.10 [Suspension of Work].</p>
Payment for Plant and Materials in Event of Suspension	8.12	<p>The Contractor shall be entitled to payment of the value (as at the date of suspension) of Plant and/ or Materials which have not been delivered to Site, if:</p> <p>i. the work on Plant or delivery of Plant and/ or Materials has been suspended for more than 28 Days, and</p> <p>ii. The Contractor has marked the Plant and/ or Materials as the Procuring Entity's property in accordance with the Engineer-in-charge's instructions.</p>
Prolonged Suspension	8.13	If the suspension under Sub-Clause 8.10 [Suspension Work]. has continued for more than 84 Days, the Contractor may request the Engineer-in-charge's permission to proceed. If the Engineer-in-charge does not give permission within 28 Days after being requested to do so, the Contractor may, by giving notice to the Engineer-in-charge, treat the suspension as an omission under Sub-Clause 9.2 [Deviations/ Variations Extent and Pricing] of the affected part of the Works. If the suspension affects the whole of the Works, the Contractor may give notice of termination under Sub-Clause 17.2 [Termination by Contractor].
Resumption of Work	8.14	After the permission or instruction to proceed is given, the Contractor and the Engineer-in-charge shall jointly

		examine the Works and the Plant and Materials affected by the suspension. The Contractor shall make good any deterioration or Defect in or loss of the Works or Plant or Materials, which has occurred during the suspension after receiving from the Engineer-in-charge an instruction to this effect under Sub-Clause 9.2 [Deviations/ Variations, Extent and Pricing].
Work to be executed strictly as per specifications	8.15	All Works under or in course of execution or executed in pursuance of the Contract shall at all times be executed strictly as per specifications of the Contract as established by regular testing at the specified frequency and be open and accessible to the quality inspection and supervision of the Engineer-in-Charge, his authorized subordinates in charge of the work and all the superior officers, officers of the Quality Control Organization, Third Party Inspection Agency, if engaged by the Procuring Entity, and the Contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the Contractor, either himself be present to receive written orders and instructions or have a responsible agent duly accredited in writing, present for that 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. All payments shall be linked to the specified quality of works and works failing on tests or not executed as per design, drawings and specifications shall not be paid unless rectified to the specified quality by the Contractor.
Action when Work executed with unsound materials, imperfect and unskilled workmanship	8.16	If it shall be established through regular testing or post execution quality testing by the third party quality inspection agency to the Engineer-in-Charge or his higher authority or his authorized subordinates in charge of the Works, that any work has been executed with unsound, imperfect, or unskillful workmanship, or with Materials or articles provided by him for the execution of the work which are unsound or of a quality inferior to that contracted or otherwise not in accordance with the Contract, the Contractor shall, on demand in writing from the Engineer-in-Charge specifying the work, Materials or articles complained of, notwithstanding that the same may have been passed, certified and paid for, forthwith rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the Materials or articles so specified and reconstruct, provide other proper and suitable Materials or articles at his own charge and Cost. In the event of the Contractor failing do so within a period specified by the Engineer-in-Charge in his demand aforesaid, then the Contractor shall be liable to pay compensation for the specified period, at the same rate as under Sub-Clause for non-completion of the work in time for this default. In such case the Engineer-in-Charge may not accept the

		<p>item of work at the rates applicable under the Contract but may accept such items at reduced rates as the competent authority may consider reasonable during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure and incidental items rectified, or removed and re-executed at the risk and cost of the Contractor. Decision of the Engineer-in-Charge to be conveyed in writing in respect of the same will be final and binding on the Contractor.</p>
<p>9. Deviations, variations and adjustments</p>		
<p>Right to Vary</p> <p><i>(Additions and Alterations in case of Lump Sum Contract)</i></p>	<p>9.1</p>	<p>Variations may be initiated by the Engineer-in-charge at any time during the execution of the Works prior to issuing the Taking-Over Certificate for the Works, either by an instruction or by a request for the Contractor to submit a proposal.</p> <p>The Contractor shall execute and be bound by each Variation, unless the Contractor promptly gives notice to the Engineer-in-charge stating (with supporting particulars) that:</p> <ul style="list-style-type: none"> i. the Contractor cannot readily obtain the Goods required for the Variation, or ii. such Variation triggers a substantial change in the sequence or progress of the Works. <p>Upon receiving this notice, the Engineer-in-charge shall cancel, confirm or vary the instruction.</p> <p>Each Variation may include:</p> <ul style="list-style-type: none"> i. changes to the quantities of any item of work included in the Contract (however, such changes do not necessarily constitute a Variation), ii. changes to the quality and other characteristics of any item of work, iii changes to the levels, positions and/ or dimensions of any part of the Works, iv. omission of any work unless it is to be carried out by others, v. any additional work, Plant, Materials or services necessary or incidental to the Works, including any associated Tests on Completion, boreholes and other testing and exploratory work, vi. Changes to the sequence or timing of the execution of the Works. <p>The Contractor shall not make any alteration and/ or modification of the Permanent Works, unless and until the Engineer-in-charge instructs or approves a Variation.</p>
<p>Deviations/ Variations</p>	<p>9.2.1</p>	<p>The Engineer-in-charge shall have power (i) to make alternations in, omissions from, additions to, or</p>

<p>Extent and Pricing</p>		<p>substitutions for the original Specifications, quantities, Drawings, designs and instructions that may be appear to him to be necessary or advisable during the progress of the Works, and (ii) to omit a part of the Works in case of non-availability of a portion of the Site or for any other reasons and the Contractor shall be bound to carry out the Works in accordance with any instructions given to him in writing signed by the Engineer-in-charge after approval from competent authority and such alterations, omissions, additions or substitutions shall form part of the Contract as if originally provided therein and any altered, additional or substituted work which the Contractor may be directed to do in the manner specified above as part of the Works, shall be carried out by the Contractor on the same conditions in all respects including price on which he agreed to do the main work except as hereafter provided.</p>
<p><i>(In case of Lump Sum Contract, Rates of measured up additions and alterations shall be as per applicable BSR or rates of Day Work given be the Contractor and forming part of the Contract)</i></p>	<p>9.2.2</p>	<p>The rates for such additional, altered or substituted works shall be determined in accordance with the following provisions:</p> <ul style="list-style-type: none"> i. If the rates for the additional, altered or substituted work are specified in the Contract for the Works, the Contractor is bound to carry out the additional, altered or substituted work at the same rates as are specified in the Contract for the Works. ii. If the rates for the additional, altered or substituted work are not specifically provided in the Contract for the Works, such rates will be derived from the rates for a similar class of work as are specified in the Contract for the Works. iii. If the rates for the additional, altered or substituted work cannot be determined in the manner specified in the sub-clauses i and ii above, then the rates for such composite work item shall be worked out on the basis of the concerned Schedule of Rates of the district/ area specified above minus/ plus the percentage which the total Bid amount bears to the estimated cost of the entire Works put to bid. Provided always that if the rate for such part or parts of the item is not in the Schedule of Rates, the rate for such part or parts will be determined by the Engineer-in-charge on the basis of the prevailing market rates when the work was done but the percentage of bid discount/ premium will not be subtracted/ added to such market rates. iv. If the rates for the additional, altered or substituted work item cannot be determined in the manner specified in sub sub-clause I to iii above then the contractor shall within 7 days of the date of receipt of order to carry out the work, inform the Engineer-in-charge of the rate which it is his intention to charge for such class of work supported by analysis of the rate(s) claimed and the Engineer-in-charge shall determine the rate/ rates on the basis of prevailing market rates and pay the

		contractor accordingly. However, the Engineer-in-charge, by notice in writing, will be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner as he may consider advisable but under no circumstances, the Contractor shall suspend the work on the plea of non-settlement of rates on items falling under this sub-clause.
	9.2.3	The quantum of additional work for each item shall not exceed 50% of the original quantity of the item given in the Contract and the total value of additional, altered, and substituted items of work shall not exceed 50% of the Accepted Contract Price. <i>(This para is not applicable in case of Lump Sum Contract)</i>
	9.2.4	The time for completion of the Works shall in the event of any deviations resulting in additional Cost over the Contract Price being ordered be extended if requested by the Contractor in the proportion which the additional Cost of the altered, additional or substituted work, bears to the original Contract Price. Similarly, the proportionate time period for an item of work deleted shall be reduced from the total time period provided in the Contract.
Value Engineering	9.3	<p>The Contractor may, at any time, submit to the Engineer-in-charge a written proposal which (in the Contractor's opinion) will, if adopted, (i) accelerate completion, (ii) reduce the Cost to the Procuring Entity of executing, maintaining or operating the Works, (iii) improve the efficiency or value to the Procuring Entity of the completed Works, or (iv) otherwise be of benefit to the Procuring Entity</p> <p>The proposal shall be prepared at the Cost of the Contractor and shall include the items listed in Sub-Clause 9.2 [Deviations, Variations and Pricing].</p> <p>If a proposal, which is approved by the Engineer-in-charge, includes a change in the design of part of the Permanent Works, then unless otherwise agreed by both Parties:</p> <ol style="list-style-type: none"> i. the Contractor shall design this part, ii. Sub-Clause 4.1 [Contractor's General Obligations] shall apply, and iii. If this change results in a reduction in the Contract value of this part, the Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine a fee, which shall be included in the Contract Price.
No compensation for alterations in or restriction of	9.4	If, at any time after the commencement of the Works, the Procuring Entity shall, for any reason, whatsoever, not require the whole Works, thereof, as specified in the Contract, to be carried out, the Engineer-in-charge shall give notice, in writing, of the fact to the Contractor, who

works to be carried out		<p>shall have no claim to any payment or compensation, whatsoever, on account of any profit or advantage which he might have derived from the execution of the Works in full but which he did not derive in consequence of the full amount of the Works not having been carried out. Neither shall he have any claim for compensation by reason of alterations having been made in the original specifications, drawings and design and instructions, which shall involve any curtailment of the Works, as originally contemplated. Provided, that the contractor shall be paid the charges for the cartage only, of Materials actually brought to the Site of the Works by him for bonafide use and rendered surplus as a result of the abandonment or curtailment of the Works or any portion thereof, and taken them back by the Contractor, provided, however, that the Engineer-in-charge shall have, in all such cases, the option of taking over all or any such Materials at their purchase price or at local market rates whichever may be less. In the case of such stores, having been issued from Procuring Entity's Stores, charges recovered, including storage charges shall be refunded after taking into consideration any deduction for claim on account of any deterioration or damage while in the custody of the Contractor and in this respect the decision of the Engineer-in-charge shall be final.</p>
Monthly Return of Extra Claims	9.5.1	<p>To facilitate timely resolution of Contractor's claims due against the orders/ instructions of the Engineer-in-Charge, the Contractor shall submit every month along with the Intermediate Payment Claims, a comprehensive statement of claims raised by him for any work claimed as extra, up to the previous month and awaiting resolution by the Engineer-in-Charge and/ or Procuring Entity. Value of claims shall be based upon the rates and prices mentioned in the Contract or in the Schedule of Rates in force in the District/ Division/ Circle for the time being. The Engineer-in-Charge shall duly acknowledge it and proceed to act as per Sub-Clause 3.5 [Determinations]. He will communicate the resolution to the Contractor and also reasons for rejection to the Contractor's claims. The contractor shall be deemed to have waived all claims, not included in such return and will have no right to enforce any such claims not included, whatsoever be the circumstances.</p> <p>However, the Contractor shall continue performance on the Contract despite rejection of his claims by the Engineer-in-Charge. Such rejected claims may then be raised before the Dispute Resolution Board or the Arbitration Tribunal, as appropriate.</p>
	9.5.2	<p>The Contractor shall send to the Engineer-in-Charge once every three Months an up to date account giving complete details of all claims for additional payments to which the Contractor may consider himself entitled and of all additional work ordered by the Engineer-in-Charge after approval from competent authority which he has executed during the preceding quarter .</p>

	9.5.3	Any operation or procedure incidental to or necessary to the execution of the Works has to be in contemplation of Bidder while submitting his Bid, whether or not, specifically indicated in the description of the item and the relevant Specifications, shall be deemed to be included in the rates quoted by the Bidder or the rate given in the said schedule of rates, as the case may be. Nothing extra shall be admissible for such operations/ procedures.
Provisional Sums	9.6	<p>Each Provisional Sum shall only be used, in whole or in part, in accordance with the Engineer-in-charge's instructions and the Contract Price shall be adjusted accordingly. The total sum paid to the Contractor shall include only such amounts, for the work, supplies or services to which the Provisional Sum relates, as the Engineer-in-charge shall have instructed. For each Provisional Sum, the Engineer-in-charge may instruct:</p> <ul style="list-style-type: none"> i. work to be executed (including Plant, Materials, labour or services to be supplied) by the Contractor and valued; and/ or ii. Plant, Materials or services to be procured by the Contractor from a Nominated Sub-Contractor as defined in Sub-Clause 5.2 [Nomination of Sub-Contractor] or otherwise; and for which there shall be included in the Contract Price: <ul style="list-style-type: none"> (a) the actual amounts paid (or due to be paid) by the Contractor, and (b) A sum for overhead charges, calculated at 10% percent of these actual amounts. <p>The amount of overheads (10%) shall be subject to tax liability as per law.</p> <p>The Contractor shall, when required by the Engineer-in-charge, produce invoices, vouchers and accounts or receipts in substantiation.</p>
Day Work	9.7	<p>For works of a minor or incidental nature, the Engineer-in-charge may instruct that a Variation shall be executed on a Day work basis. The work shall then be valued in accordance with the Day work Schedule included in the Contract, and the following procedure shall apply. If a Day work Schedule is not included in the Contract, this Sub-Clause shall not apply.</p> <p>Before ordering materials for the work, the Contractor shall submit quotations to the Engineer-in-charge. When applying for payment, the Contractor shall submit invoices, vouchers and accounts or receipts for any Materials/ Equipment/ Plant/ Temporary Works.</p> <p>Except for any items for which the Day work Schedule specifies that payment is not due, the Contractor shall deliver each day to the Engineer-in-charge accurate statements in duplicate which shall include the following</p>

	<p>details of the resources used in executing the previous day's work:</p> <ol style="list-style-type: none"> i. the names, occupations, day wages and required time period of Contractor's Personnel, ii. the identification, type and time of Contractor's Equipment and Temporary Works, and iii. The quantities and types of Plant and Materials used. <p>One copy of each statement will, if correct, or when agreed, be signed by the Engineer-in-charge and returned to the Contractor. The Contractor shall then submit priced statements of these resources to the Engineer-in-charge, prior to their inclusion in the next Statement under Sub-Clause 15.5 [Issue of Interim Payment Certificates].</p>
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10. Price Variation

<p>Price Variation due to changes in the prices of labour, materials, bitumen, petroleum, cement and steel</p>	<p>10.1</p> <p>If, during the progress of the contract of value exceeding Rs. 50 lakh (accepted Contract Price minus cost of material supplied by the Procuring Entity), and where stipulated completion period is more than 3 months (both the conditions should be fulfilled), the price, of any materials/ bitumen/ diesel and petrol/ cement/ steel incorporated in the Works (not being materials to be supplied by the Procuring Entity) and/ or wages of labour increases or decreases, as compared to the price and/ or wages prevailing at the date of opening of bids or date of negotiations for the Works, the amounts payable to Contractor for the Works shall be adjusted for increase or decrease in the rates of materials (excepting those materials supplied by the Procuring Entity)/ labour/ bitumen /diesel and petrol/ cement/ steel. If negotiated rates have been accepted, prices as on the date of negotiation shall be considered for price adjustment. Similarly, if rates received on the date of opening of bids have been accepted, then prices on the date of opening of bids shall be considered for price adjustment.</p> <p>Increase or decrease in the cost of labour/ material/ diesel and petrol/ cement/ steel shall be calculated quarterly and cost of bitumen shall be calculated on monthly basis in accordance with the following formula:-</p> <p>(A) Labour</p> $V_L = 0.75 \times \frac{P_L}{100} \times R \times \frac{(I_{L1} - I_{L0})}{I_{L0}}$ <p>Where,</p> <p>V_L = Increase or decrease in the cost of Works during the quarter under consideration due to change in rates for labour.</p> <p>R = The value of the Works done in rupees during the</p>
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quarter under consideration excluding the cost of materials supplied by the Procuring Entity and excluding other items as mentioned in this Sub-Clause.

I_{L0} = The average consumer price index for industrial workers (whole-sale prices) for the quarter in which bids were opened/ negotiated (as published in Reserve Bank of India Journal/ Labour Bureau Simla, for the area).

I_{L1} = The average consumer price index for industrial workers (whole-sale prices) for the quarter of calendar year under consideration (as published in Reserve Bank of India Journal/ Labour Bureau Simla, for the area).

P_L = Percentage of labour components.

Note: In case of revision of minimum wages by the Government or other competent authority, nothing extra would be payable except the price escalation permissible under this Sub-Clause.

(B) Materials (excluding materials supplied by the Procuring Entity).

$$V_M = 0.75 \times \frac{P_M}{100} \times R \times \frac{(L_{M1} - L_{M0})}{L_{M0}}$$

Where,

V_M = Increase or decrease in the cost of Works during the quarter under consideration due to change in rates for materials.

R = The value of the Works done in rupees during the quarter under consideration excluding the cost of materials supplied by the Procuring Entity and excluding other items as mentioned in this Sub-Clause.

L_{M0} = The average wholesale price index (all commodities) for the quarter in which bids were opened/ negotiated (as published in Reserve Bank of India Journal/ Economic Adviser to Government of India, Ministry of Industries, for the area).

L_{M1} = The average wholesale price index (all commodities) for the quarter under consideration (as published in Reserve Bank of India Journal/ Economic Adviser to Government of India, Ministry of Industries, for the area).

P_M = Percentage of materials components (excluding materials supplied by the Procuring Entity).

(C) Bitumen

$$V_b = 0.75 \times \frac{P_b}{100} \times R \times \frac{(B_i - B_0)}{B_0}$$

100 B₀

Where,

V_b = Increase or decrease in the cost of Works during the month under consideration due to changes in the rate for bitumen.

R = The value of the Works done in rupees during the month under consideration excluding the cost of materials supplied by the Procuring Entity and excluding other items as mentioned in this Sub-Clause.

B₀ = The official retail price of bitumen at the IOC depot at nearest center on the day 28 days prior to date of opening of Bids.

B_i = The official retail price of bitumen of IOC depot at nearest center for the 15th day of the month under consideration.

P_b = Percentage of bitumen components of the Works.]

(D) Petroleum

$$V_f = 0.75 \times \frac{P_f}{100} \times R \frac{(F_i - F_0)}{F_0}$$

Where,

V_f = Increase or decrease in the cost of Works during the quarter under consideration due to change in rates for fuel and lubricants.

R = The value of the Works done in rupees during the quarter under consideration excluding the cost of materials supplied by the Procuring Entity and excluding other items as mentioned in this Sub-Clause.

F₀ = The average wholesale price index of High Speed Diesel (HSD) as published by the Economic Adviser to the Government of India, Ministry of Industry on the day of opening of bids/ negotiations.

F_i = The average whole sale price Index of HSD for the quarter under consideration as published weekly by the Economic Adviser to the Government of India, Ministry of Industry for the quarter under consideration.

P_f = Percentage of fuel and lubricants components excluding fuel and lubricants supplied by the Procuring Entity (Specified in the sanctioned estimate for the Works).

R = Total Works done during the quarter as prescribed under this Sub-Clause.

Note: For application of this Sub-Clause price of HSD is chosen to indicate fuel and lubricants components.

		<p>(E) Cement</p> $V_C = 0.75 \times \frac{P_C}{100} \times R \times \frac{(L_{C1} - L_{C0})}{L_{C0}}$ <p>Where,</p> <p>V_C = Increase or decrease in the cost of Works during the quarter under consideration due to change in the rates of cement.</p> <p>R = The value of the Works done in rupees during the quarter under consideration excluding the cost of cement supplied by the Procuring Entity and excluding other items as mentioned in this Sub-Clause.</p> <p>L_{C0} = The average wholesale price index for the quarter in which bids were opened/ negotiated (as published by the Economic Adviser to the Government of India, Ministry of Industries).</p> <p>L_{C1} = The average whole sale price Index for the quarter under consideration (as published by the Economic Adviser to Government of India, Ministry of Industries).</p> <p>P_C = Percentage of cement components (excluding cement supplied by the Procuring Entity).</p> <p>(F) Steel</p> $V_S = 0.75 \times \frac{P_S}{100} \times R \times \frac{(L_{S1} - L_{S0})}{L_{S0}}$ <p>Where,</p> <p>V_S = Increase or decrease in the cost of Works during the quarter under consideration due to change in the rates of steel.</p> <p>R = The value of the Works done in rupees during the quarter under consideration excluding the cost of steel supplied by the Procuring Entity and excluding other items as mentioned in this Sub-Clause.</p> <p>L_{S0} = The average wholesale price index for the quarter in which bids were opened/ negotiated (as published by the Economic Adviser to the Government of India, Ministry of Industries).</p> <p>L_{S1} = The average wholesale price Index for the quarter under consideration (as published by the Economic Adviser to Government of India, Ministry of Industries).</p> <p>P_S = Percentage of steel components (excluding steel supplied by the Procuring Entity).</p>
<p>Price Variation in installation of elevators,</p>	<p>10.2</p>	<p>In all cases of contracts for installation of elevators, supply/ installation of Central Air Conditioning and Central Evaporating Cooling Works, the price quoted shall be</p>

supply/installation of Centrally Air Conditioning and Central Evaporating Cooling Works.

based on the Indian Electrical and Electronics Manufacturers Association (IEEMA) price variation Sub-Clause based on the cost of raw materials/ components and labour cost as on the date of quotation/ bid, and the same is deemed to be related to wholesale price index number of metal products and All India Average consumer price index number of industrial workers as specified below. In case of any variation in these index numbers, the prices shall be subject to adjustment up or down in accordance with following formula:

$$P = \frac{P_0}{100} \left[15 + 55 \frac{MP}{MP_0} + 15 \frac{W_0(D)}{W_0} + 15 \frac{W_0(1)}{W_0} \right]$$

Where,

P = Price payable as adjusted in accordance with the above price variation formula.

P₀ = Price quoted/ confirmed.

MP₀ = Wholesale Price Index Number for Metal Products as published by the office of the Economic Adviser, Ministry of Industry, Government of India, in their weekly bulletin, Revised Index Number of Wholesale Prices (Base: 1981- 82 = 100) for the week ending first Saturday of the relevant calendar month. The relevant month shall be that in which price was offered or negotiated whichever is later.

W₀ = All India Average Consumer Price Index Number for Industrial workers (Base : 1982 = 100), as published by Labour Bureau, Ministry of Labour, Government of India, for relevant calendar month. The relevant month shall be that in which price was offered or negotiated whichever is later.

The above index number MP₀ & W₀ are those published by IEEMA as prevailing on the first working day of the calendar month FOUR months prior to the date of bidding.

MP = Wholesale Price Index Number for Metal Products as published by the office of the Economic Adviser, Ministry of Industry, Government of India, in their weekly bulletin Revised Index Number of Wholesale Prices (Base: 1981-82 = 100). The applicable wholesale price Index Number for Metal Products as prevailing on 1st Saturday of the month covering the date FOUR months prior to .the date of delivery and would be as published by IEEMA.

W₀(D) = All India Average Consumer Price Index Number for Industrial Workers prevailing for the month covering the date FOUR months prior to the date of delivery of manufactured material and would be as published by IEEMA.

W₀(1) = All India Average Consumer Price Index Number for Industrial Workers (Base : 1982 = 100) as published by Labour Bureau, Ministry of Labour,

		<p>Government of India. The applicable All India Consumer Price Index Number of Industrial Workers prevailing for the FOUR months prior to the date of completion of installation/ progress parts of installation and would be as published by IEEMA. The date of delivery shall be the date on which the manufactured material is actually supplied at Site. The date of completion of installation (or progress part of installation) shall be the date on which the Works is notified as being completed and is available for inspection/ duly tested. In the absence of such notification, the date of completion is not intimated, such completion shall be considered by the Engineer Incharge which shall be final.</p> <p>Note-1 The Wholesale Price Index Number for Metal Products is published weekly by the office of the Economic Adviser, but if there are any changes, the same are incorporated in the issue appearing in the following week. For the purpose of this Price Variation Sub-Clause, the final index figures shall apply.</p> <p>Note-2 The sole purpose of the above stipulation is to arrive at the entire Contract under the various situations. The above stipulation does not indicate any intentions to sell materials under this Contract as movables.</p> <p>Note-3 The indices MP & Wo are regularly published by IEEMA in monthly basic price circulars based on information bulletins from the authorities mentioned. These will be used for determining price variation and only IEEMA Circulars will be shown as evidence, if required.</p>
General Conditions for admissibility of Price Variation	10.3	The General Conditions for admissibility of Price Variation are given in Appendix A to these General Conditions.
11. Tests on completion		
Contractor's obligations	11.1	<p>The Contractor shall carry out the Tests on Completion in accordance with the BIS/ IRC and other standard codes and Sub-Clause 7.9 [Testing], after providing the documents in accordance with the requirements for tests on completion.</p> <p>The Contractor shall give to the Engineer-in-charge not less than 15 Days' notice of the date after which the Contractor will be ready to carry out each of the Tests on Completion. Unless otherwise agreed, Tests on Completion shall be carried out within 7 Days after this date, on such day or Days as the Engineer-in- charge shall instruct.</p> <p>In considering the results of the Tests on Completion, the Engineer-in-charge shall make allowances for the effect of any use of the Works by the Procuring Entity on the</p>

		performance or other characteristics of the Works. As soon as the Works, or a Section, have passed any Tests on Completion, the Contractor shall submit a certificate of the results of these Tests to the Engineer-in-charge.
Delayed Tests	11.2	<p>If the Tests on Completion are being unduly delayed by the Engineer-in-charge, Sub-Clause 7.9.2 of 7.9 [Testing] shall be applicable.</p> <p>If the Tests on Completion are being unduly delayed by the Contractor, the Engineer-in-charge may by notice require the Contractor to carry out the Tests within 21 Days after receiving the notice. The Contractor shall carry out the Tests on such day or Days within that period as the Contractor may fix and of which he shall give notice to the Engineer-in-charge.</p> <p>If the Contractor fails to carry out the Tests on Completion within the period of 21 Days, the Procuring Entity's/ Engineer-in-Charge's Personnel may proceed with the Tests at the field laboratory or at an outsourced laboratory at the risk and cost of the Contractor. The Tests on Completion shall then be deemed to have been carried out in the presence of the Contractor and the results of the Tests shall be accepted as accurate and binding on the Contractor.</p>
Retesting	11.3	If the Works, or a Section, fails to pass the Tests on Completion, Sub-Clauses 7.13 [Rejection] and 11.4 [Failure to Pass Tests on Completion] shall apply, and the Engineer-In-Charge or the Contractor may require the failed Tests, and Tests on Completion on any related work, to be repeated under the same terms and conditions.
Failure to Pass Tests on Completion	11.4	<p>If the Works, or a Section, fails to pass the Tests on Completion repeated under Sub-Clause 11.3 [Retesting], the Engineer-in-Charge shall be entitled to:</p> <ul style="list-style-type: none"> i. Order further repetition of Tests on Completion; ii. If failure deprives the Procuring Entity of substantially the whole benefit of the Works or Section, reject the Works or Section (as the case may be), in which event the Procuring Entity shall have the same remedies as provided in Sub-paragraph (c) of Sub-Clause 13.6 [Failure to Remedy Defect]; or iii. Issue a Taking-Over Certificate, if the Procuring Entity so requires. <p>In the event of Sub-para iii, the Contractor shall proceed in accordance with all other obligations under the Contract, and the Contract Price shall be reduced by such amount as shall be appropriate to cover the reduced value to the Procuring Entity as a result of this failure. Unless the relevant reduction for this failure is stated (or its method of calculation is defined) in the Contract, the Procuring Entity may require the reduction to be (i) agreed by the</p>

		Contractor (in full satisfaction of this failure only) and paid before this Taking-Over certificate is issued, or (ii) determined and paid under Sub-Clause 3.5 [Determinations].
12. Taking over of the Works and Sections by Procuring Entity		
Taking over of works.	12.1	<p>Except as stated in Sub-Clause 11.4 [Failure to Pass Tests on Completion], the Works shall be taken over by the Procuring Entity when (a) the Works have been completed in accordance with the Contract, including the matters described in Sub-Clause 8.4 [Time for Completion] and except as allowed in sub-paragraph i. below, and (b) a Taking-Over Certificate for the Works has been issued, or is deemed to have been issued in accordance with this Sub-Clause.</p> <p>The Contractor may apply by notice to the Engineer-in-charge for a Taking-Over Certificate not earlier than 14 Days before the Works will, in the Contractor's opinion, be complete and ready for taking over. If the Works are divided into Sections, the Contractor may similarly apply for a Taking-Over Certificate for each Section.</p> <p>The Engineer-in-charge shall, within 28 Days after receiving the Contractor's application:</p> <ul style="list-style-type: none"> i. issue the Taking-Over Certificate to the Contractor, stating the date on which the Works or Section was completed in accordance with the Contract, except for any minor outstanding work and Defects which will not substantially affect the use of the Works or Section for their intended purpose (either until or whilst this work is completed and these Defects are remedied); or ii. reject the application, giving reasons and specifying the work required to be done by the Contractor to enable the Taking-Over Certificate to be issued. The Contractor shall then complete this work before issuing a further notice under this Sub-Clause. <p>If the Engineer-in-charge fails either to issue the Taking-Over Certificate or to reject the Contractor's application within the period of 28 Days, and if the Works or Section (as the case may be) are substantially in accordance with the Contract, the Taking-Over Certificate shall be deemed to have been issued on the last day of that period.</p>
Taking over of Parts of the Works	12.2	<p>The Engineer-in-charge may, at the sole discretion of the Procuring Entity, issue a Taking-Over Certificate for any part of the Permanent Works.</p> <p>The Procuring Entity shall not use any part of the Works (other than as a temporary measure which is either specified in the Contract or agreed by both Parties) unless and until the Engineer-in-charge has issued a Taking-Over Certificate for this part. However, if the Procuring Entity</p>

		<p>does use any part of the Works before the Taking-Over Certificate is issued:</p> <ul style="list-style-type: none"> i. the part which is used shall be deemed to have been taken over as from the date on which it is used, ii. the Contractor shall cease to be liable for the care of such part as from this date, when responsibility shall pass to the Procuring Entity, and iii. if requested by the Contractor, the Engineer-in-charge shall issue a Taking-Over Certificate for this part. <p>After the Engineer-in-charge has issued a Taking-Over Certificate for a part of the Works, the Contractor shall be given the earliest opportunity to take such steps as may be necessary to carry out any outstanding Tests on Completion. The Contractor shall carry out these Tests on Completion as soon as practicable before the expiry date of the relevant Defects Notification Period.</p> <p>If the Contractor incurs Cost as a result of the Procuring Entity taking over and/ or using a part of the Works, other than such use as is specified in the Contract or agreed by the Contractor, the Contractor shall:</p> <p>(a) give notice to the Engineer-in-charge, and (b) be entitled subject to Sub-Clause 21.2 [Contractor's Claims] to payment of any such Cost, which shall be included in the Contract Price. After receiving this notice, the Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine this Cost.</p> <p>If a Taking-Over Certificate has been issued for a part of the Works (other than a Section), the delay damages thereafter for completion of the remainder of the Works shall be reduced. Similarly, the delay damages for the remainder of the Section (if any) in which this part is included shall also be reduced. For any period of delay after the date stated in this Taking-Over Certificate, the proportional reduction in these delay damages shall be calculated as the proportion which the value of the part so certified bears to the value of the Works or Section (as the case may be) as a whole. The Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these proportions. The provisions of this paragraph shall only apply to the rate of delay damages under Sub-Clause 8.9 [Compensation/ Damages for Delay], and shall not affect the maximum amount of these damages.</p>
<p>Taking over if Tests on Completion suffer Interference</p>	<p>12.3</p>	<p>If the Contractor is prevented, for more than 14 days, from carrying out the Tests on Completion by a cause for which the Procuring Entity is responsible, the Procuring Entity shall be deemed to have taken over the Works or Section (as the case may be) on the date when the Tests on Completion would otherwise have been completed.</p>

		<p>The Engineer-in-charge shall then issue a Taking-Over Certificate accordingly, and the Contractor shall carry out the Tests on Completion as soon as practicable, before the expiry date of the Defects Notification Period. The Engineer-in-charge shall require the Tests on Completion to be carried out by giving 14 days' notice and in accordance with the relevant provisions of the Contract.</p> <p>If the Contractor suffers delay and/ or incurs Cost as a result of this delay in carrying out the Tests on Completion, the Contractor shall give notice to the Engineer-in-Charge and shall be entitled subject to Sub-Clause 21.2 [Contractor's Claims] to:</p> <ul style="list-style-type: none"> i. an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.6 [Extension of time for Completion], and ii. payment of any such Cost, which shall be included in the Contract Price. <p>After receiving this notice, the Engineer-in-Charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p>
Surfaces Requiring Reinstatement	12.4	<p>Except as otherwise states in a Taking Over Certificate, a Certificate for a Section or part of the Works shall not be deemed to certify completion of any ground or other surfaces requiring reinstatement.</p>
13. Defect Liability		
Defect Liability Period	13.1	<p>It is the period, as specified in the Contract data, after certified total completion or after a suspension (short or prolonged) or termination of the Works by the Engineer-in-Charge or the Contractor and handing over of the Works (including Sections or parts handed over earlier) to the Engineer-in-Charge, during which the Contractor is responsible for remedying/ repairing, restoring to the original condition any apparent, virtual or observed defects, deficiencies in the Works, or its performance. The Contractor shall have to repair & restore the defect/ deficiency after a notice issued by the Engineer-in-Charge, who will be free to get it remedied at the risk and cost of the Contractor besides other action being taken as per the Contract, if the Contractor does not get it remedied within the period specified in such notice. The attendances to normal wear and tear due to use by the Procuring Entity/ occupier, in respect of sections or parts taken over for the convenience of the Procuring Entity, shall not be treated as defect.</p>
Completion of Outstanding Work and Remedying Defects.	13.2	<p>In order that the Works and Contractor's Documents, and each Section, shall be in the condition required by the Contract (fair wear and tear excepted) by the expiry date of the relevant Defects Notification Period or as soon as practicable thereafter, the Contractor shall:</p>

		<p>i. complete any work which is outstanding on the date stated in a Taking-Over Certificate, within such reasonable time as is instructed by the Engineer-in-charge, and</p> <p>ii. Execute all work required to remedy Defects or damage, as may be notified by (or on behalf of) the Procuring Entity on or before the expiry date of the Defects Notification Period for the Works.</p> <p>If a Defect appears or damage occurs, the Contractor shall be notified accordingly, by (or on behalf of) the Procuring Entity. The Contractor is required to repair, rectify, the defects, restore the damages at his own cost with in the period indicated in the notice by the Procuring Entity. If the Contractors fails to do so, action as per Sub-Clause 13.3 shall be taken.</p>
<p>Cost of Remedying Defects</p>	<p>13.3</p>	<p>All work referred to in Sub-Clause 13.2 above [Completion of Outstanding Work and Remedying Defects] shall be executed at the risk and cost of the Contractor, if and to the extent that the work is attributable to:</p> <ul style="list-style-type: none"> i. any design for which the Contractor is responsible, ii. Plant, Materials or workmanship not being in accordance with the Contract, or iii. Failure by the Contractor to comply with any other obligation. <p>The cost to be debited shall be arrived at as under:</p> <p>(a) Cost of remedial work (including taxes) as paid to other agency or debited to the contractor if the remedial action is taken up by the department/ organisation, plus</p> <p>(b) A compensation of 15% , less</p> <p>(c) Credit the cost of materials, hire charges of Contractor's plant and machinery if used in the remedial work.</p> <p>If and to the extent that such work is attributable to any other cause, the Contractor shall be notified promptly by (or on behalf of) the Procuring Entity and Sub-Clause 9 [Deviations, Variations and Adjustments] shall apply.</p>
<p>Extension of Defects Notification Period</p>	<p>13.4</p>	<p>The Procuring Entity shall be entitled subject to Sub-Clause 2.5 [Procuring Entity's Claims] to an extension of the Defects Notification Period for the Works or a Section if and to the extent that the Works, Section or a major item of work (as the case may be, and after taking over) cannot be used for the purposes for which they are intended by reason of a Defect, deficiency or by reason of damage attributable to the Contractor. However, a Defects Notification Period shall not be extended by more than two years.</p> <p>If delivery and/ or erection of Plant and/ or Materials was suspended under Sub-Clause 8.10 [Suspension of Work] or Sub-Clause 17.1 [Contractor's Entitlement to Suspend</p>

		Work], the Contractor's obligations under this Sub-Clause shall not apply to any Defects or damage occurring more than two years after the Defects Notification Period for the Plant and/ or Materials would otherwise have expired.
Contractor liable for Damages done and for Imperfections	13.5	<p>If the Contractor or his personnel shall break, deface, injure or destroy any part of a building or any structure in which they may be working, or any building, road, fence, enclosure, water pipe, power/ telecom cables, drains, electric or telephone post or wires, trees, etc. or cultivated ground contiguous to the Site where the Works or any part of it is being executed, or if any damage shall happen to the work while in progress, from any cause whatever or if any defect, shrinkage or other faults or imperfection appear in the work within Defect Liability Period after a certificate final or otherwise of its completion shall have been given by the Engineer-in-Charge as aforesaid arising out of Defect or improper Materials, procedures or workmanship the Contractor shall upon receipt of a notice in writing on that behalf make the same good at his own expense or in default the Engineer-in-Charge cause the same to be made good by employing other workman/ agency and deduct the expense from any sums that may be due or at any time thereafter may become due to the Contractor, or from his Performance Security or the proceeds of sale thereof or a sufficient portion thereof.</p>
Failure to remedy the defect	13.6	<p>If the Contractor fails to remedy any Defect, deficiency or damage within a reasonable time, a date may be fixed by (or on behalf of) the Procuring Entity, on or by which the Defect, deficiency or damage is to be remedied. The Contractor shall be given reasonable notice of this date.</p> <p>If the Contractor fails to remedy the Defect or damage by this notified date and this remedial work was to be executed at the cost of the Contractor under Sub-Clause 13.3 [Cost of Remedying Defects], the Procuring Entity may (at his option):</p> <ol style="list-style-type: none"> i. carry out the work himself or by others, in a reasonable manner and at the Contractor's cost, but the Contractor shall have no responsibility for this work; and the Contractor shall subject to Sub-Clause 2.5 [Procuring Entity's Claims] pay to the Procuring Entity the costs reasonably incurred by the Procuring Entity in remedying the Defect or damage; ii. require the Engineer-in-charge to agree or determine a reasonable reduction in the Contract Price in accordance with Sub-Clause 3.5 [Determinations]; or iii If the Defect or damage deprives the Procuring Entity of substantially the whole benefit of the Works or any major part of the Works, terminate the Contract as a whole, or in respect of such major part which cannot be put to the intended use. Without prejudice to any other rights, under the Contract or otherwise, the Procuring

		Entity shall then be entitled to recover all sums paid for the Works or for such part (as the case may be), plus financing Costs and the Cost of dismantling the same, clearing the Site and returning Plant and Materials to the Contractor.
Removal of Defective Work	13.7	If the Defect or damage cannot be remedied expeditiously on the Site and the Procuring Entity gives consent, the Contractor may remove from the Site for the purposes of repair such items of Plant as are Defective or damaged. This consent may require the Contractor to increase the amount of the Performance Security by the full replacement Cost of these items, or to provide other appropriate security.
Further Tests	13.8	<p>If the work of remedying of any Defect or damage may affect the performance of the Works, the Engineer-in-charge may require the repetition of any of the tests described in the Contract. The requirement shall be made by notice within 28 Days after the Defect or damage is remedied.</p> <p>These tests shall be carried out in accordance with the terms applicable to the previous tests, except that they shall be carried out at the risk and cost of the Party liable, under Sub-Clause 13.3 [Cost of Remedying Defects], for the cost of the remedial work.</p>
Contractor / Third Party Quality Inspection Agency to Search for the Cause of the Defect.	13.9	The Contractor or third party quality inspection agency shall, if required by the Engineer-in-charge, search for the cause of any Defect, under the direction of the Engineer-in-charge. Unless the Defect is to be remedied at the cost of the Contractor under Sub-Clause 13.3 [Cost of Remedying Defects], the cost of the search shall be agreed or determined by the Engineer-in-charge in accordance with Sub-Clause 3.5 [Determinations] and shall be included in the Contract Price or of the third party quality inspection agency.
Performance Certificate	13.10	<p>Performance of the Contractor's obligations shall not be considered to have been completed until the Engineer-in-charge has issued the Performance Certificate to the Contractor, stating the date on which the Contractor completed his obligations under the Contract.</p> <p>The Engineer-in-charge shall issue the Performance Certificate within 28 Days after the latest of the expiry dates of the Defects Liability Periods, or as soon thereafter as the Contractor has supplied all the Contractor's Documents and completed and tested all the Works, including remedying any Defects. A copy of the Performance Certificate shall be issued to the Procuring Entity.</p> <p>Only the Performance Certificate shall be deemed to constitute acceptance of the Works.</p>

Substantial Completion of Parts	13.11	If any part of the Permanent Works has been substantially completed and has satisfactorily passed any Test on Completion prescribed by the Contract, the Engineer-in-charge may issue a Taking-Over Certificate in respect of that part of the Permanent Works before completion of Works and upon the issue of such Certificate, the Contractor shall be deemed to have undertaken to complete with due expedition any outstanding work in that part of the Permanent Works during Defect Liability Period.
Unfulfilled Obligations	13.12	After the Performance Certificate has been issued, each Party shall remain liable for the fulfillment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of unperformed obligations, the Contract shall be deemed to remain in force.
Right to Access	13.13	Until the Performance Certificate has been issued, the Contractor shall have such right of access to the Works as is reasonably required in order to comply with this Sub-Clause, except as may be inconsistent with the Procuring Entity's reasonable security restrictions.
Clearance of Site	13.14	<p>Upon receiving the Performance Certificate, the Contractor shall remove any remaining Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works from the Site.</p> <p>If all these items have not been removed within 28 days after receipt by the Contractor of the Performance Certificate, the Procuring Entity may sell or otherwise dispose of any remaining items. The Procuring Entity shall be entitled to be paid the costs incurred in connection with, or attributable to, such sale or disposal and restoring the Site.</p> <p>Any balance of the moneys from the sale shall be paid to the Contractor. If these moneys are less than the Procuring Entity's costs, the Contractor shall pay the outstanding balance to the Procuring Entity.</p>
14. Measurement and Evaluation. (In case of Lump Sum Contract measurement of only additions and alterations shall be taken)		
Measurement of Work Done	14.1	<p>Whenever the Engineer-in-charge requires any part of the Works to be measured/ re-measured, reasonable notice shall be given to the Contractor's Representative, who shall:</p> <ul style="list-style-type: none"> i. promptly either attend or send another qualified representative to assist the Engineer-in-charge in taking/ verifying the measurement, and ii. Supply any particulars requested by the Engineer-in-charge for his satisfaction of the measurements. <p>If the Contractor fails to attend or send a representative,</p>

		the measurement made by (or on behalf) of the Engineer-in-charge shall be accepted as accurate.
Method of measurement.	14.2.1	<p>The measurements (as per IS 1200) of the executed and acceptable work shall be recorded once in a month by the representative of the Engineer-in-Charge and the Contractor or his representative jointly and shall be signed by the Contractor in acceptance. The Engineer-in-Charge shall, except as otherwise provided, shall check, ascertain and determine measurement and the value of the work done in accordance with the Contract. The Procuring Entity reserves to itself the right to prescribe a scale of check measurements of work, in general, or a specific scale for specific works or by other special orders (about which the decision of the Procuring Entity shall be final). Checking of measurement by a superior officer shall supersede the measurements taken by the subordinate officers and the former will become the basis of the payment. Any excess payments detected, as a result of such check measurement or otherwise at any stage upto the date of completion and the Defect Liability Period specified elsewhere in this Contract, shall be recoverable from the Contractor as any other dues payable to the Procuring Entity.</p> <p>The Contractor shall, without extra charge, provided all necessary assistance with labour and equipment necessary for measurements and recording levels.</p> <p>If the Contractor objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by both the parties.</p>
	14.2.2	All measurement of all items having financial value shall be recorded in Measurement Book or MS Excel file and printed out in two copies. The original shall be treated as the Measurement book. Such files in original shall be mailed to the Engineer-in-Charge and shall be saved with a dedicated password. Other data like initial field levels or survey field books or findings of the geotech investigations shall be similarly recorded and protected so that a complete record is obtained of all works performed under the Contract.
	14.2.3	If for any reason the Contractor or his authorized representative is not available and the work of recording measurements is suspended by the Engineer-in-charge or his representative, the Engineer-in-Charge and the Department/ Organisation shall not entertain any claim from Contractor for any loss or damages on this account. If

		<p>the Contractor or his authorized representative does not remain present at the time of such measurements after the Contractor or his authorized representative has been given a notice in writing three (3) Days in advance or fails to countersign or to record objection within seven days from the date of the measurement, then such measurements recorded in his absence by the Engineer-in-charge or his representative shall be deemed to have been accepted by the Contractor.</p> <p>Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken of the net actual quantities in accordance with the procedure set forth in the Bill of Quantities and IS 1200 notwithstanding any general or local practice.</p> <p>The Contractor shall give not less than seven Day's notice to the Engineer-in-Charge or his authorized representative in charge of the Works before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimension thereof be taken before the same is covered up or placed beyond the reach of measurements and shall not cover and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorized representative in charge of the Works who shall within the aforesaid period of seven Days inspect the work, and if any work shall be covered up or placed beyond the reach of measurements without such notice having been given or the Engineer-in-charge's consent being obtained in writing, the same shall be uncovered at the Contractor's expense, for the due measurement or in default thereof no payment or allowance shall be made for such works or the materials with which the same was executed. The covering shall then be restored by the Contractor at his cost.</p> <p>Engineer-in-Charge or his authorized representative may cause either themselves or through another officer of the Department/ Organisation to check the measurements recorded jointly or otherwise as aforesaid and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.</p> <p>It is also a term of this Contract that recording of measurements of any item of work in the measurement sheets/ Measurement book and/ or its payment in the interim, on account or final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates, nor shall it relieve the Contractor from liabilities from any other measurement, Defects noticed till completion of the Defects liability period.</p>
Omissions	14.3	<p>Whenever the omission of any work forms part (or all) of a Variation, the value of which has not been agreed, if:</p> <p>i. the Contractor will incur (or has incurred) Cost which, if the work had not been omitted, would have been</p>

		<p>deemed to be covered by a sum forming part of the Accepted Contract Amount;</p> <p>ii. the omission of the work will result (or has resulted) in this sum not forming part of the Contract Price; and</p> <p>iii. this Cost is not deemed to be included in the evaluation of any substituted work; then the Contractor shall give notice to the Engineer-in-charge accordingly, with supporting particulars. Upon receiving this notice, the Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine this Cost, which shall be included in the Contract Price.</p>
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15. Contract Price, Payment and Lien

Contract price	15.1	<p>Unless otherwise stated in the Particular Conditions:</p> <p>i. the Contract Price shall be agreed or determined and be subject to adjustments in accordance with the Contract;</p> <p>ii. the Contractor shall pay all taxes, duties and fees required to be paid by him under the Contract, and the Contract Price shall not be adjusted for any of these Costs except as stated in Sub-Clause 15.21 [Adjustments for Changes in Legislation] or Price adjustment;</p> <p>iii. any quantities which may be set out in the Bill of Quantities or other Schedule are estimated quantities and are not to be taken as the actual and correct quantities:</p> <p>(a) of the Works which the Contractor is required to execute, or</p> <p>(b) for the purposes of Sub-Clause 11 [Measurement and Evaluation]; and</p> <p>iv. the Contractor shall submit to the Engineer-in-charge, within 28 Days after the Commencement Date, a proposed breakdown of each lump sum price in the Schedules. The Engineer-in-charge may take account of the breakdown when preparing Payment Certificates, but shall not be bound by it.</p>
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Lump sum provisions in Estimate/ Contract	15.2	<p>When the estimate includes lump sum provisions primarily in respect of parts of work/ items whose specifications and costs are not known at the time of framing the Estimate, and if a bid is to be invited on such an estimate, such lump sum shall be excluded from the bid.</p> <p>Subsequently, when the specifications and costs of such items are known, their execution, if to be completed concurrently with the Contract, shall either be done as a variation item or on market rates (without bid premium) of the Contract. Such variation should be approved by the competent authority and then the Contractor shall be entitled to payment in respect of such items of work, or separate bids shall be invited for the work to be executed</p>
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		concurrently with the present Contract.
Schedule of Payments <i>(in case of Lump Sum Contract payments shall be linked to various stages of completion of Works given in the Activity Schedule)</i>	15.3	<p>The schedule of payments shall be as included in the Contract. If the Contract does not include a schedule of payments, the Contractor shall submit non-binding estimates of the payments which he expects to become due during each quarterly period. The first estimate shall be submitted within 28 Days after the Commencement Date. Revised estimates shall be submitted at quarterly intervals, until the Taking-Over Certificate has been issued for the Works. The percentage quoted in the Bid and accepted in the Contract will be deducted/added from/to the gross amount of the bill.</p>
Application for Interim Payment Certificates (Running Account Bills)	15.4	<p>The Contractor shall submit a Statement in required number of copies to the Engineer-in-Charge after the end of each month, in a form approved by the Engineer-in-Charge, showing in detail the amounts to which the Contractor considers himself to be entitled on the basis of measurement (or Activity Schedule in case of Lump sum Contract) and advance payment, secured advance, deductions, etc. as applicable, together with supporting documents which shall include the report on the progress during this month in accordance with Sub-Clause 4.20 [Progress Reports].</p>
Issue of Interim Payment Certificates	15.5	<p>No amount will be certified or paid until the Procuring Entity has received and accepted the Performance Security. Thereafter, the Engineer-in-charge shall, within 28 Days after receiving a Statement and supporting documents, deliver to the Procuring Entity and to the Contractor an Interim Payment Certificate which shall state the amount which the Engineer-in-charge fairly determines to be due, with all supporting particulars for any reduction or withholding made by the Engineer-in-charge on the Statement, if any.</p> <p>However, prior to issuing the Taking Over Certificate for the Works, the Engineer-in-charge shall not be bound to issue an Interim Payment Certificate in an amount which would (after retention and other deductions) be less than the minimum amount of Interim Payment Certificate (if any) stated in the Contract Data. In this event, the Engineer-in-charge shall give notice to the Contractor accordingly.</p> <p>An Interim Payment Certificate shall not be withheld for any other reason, although:</p> <ul style="list-style-type: none"> i. if anything supplied or work done by the Contractor is not in accordance with the Contract, the cost of rectification or replacement may be withheld until rectification or replacement has been completed; and/or ii. if the Contractor was or is failing to perform any work or obligation in accordance with the Contract, and had been so notified by the Engineer-in-charge, the value of this work or obligation may be withheld until the

		<p>work or obligation has been performed.</p> <p>The Engineer-in-charge may in any Payment Certificate make any correction or modification that should properly be made to any previous Payment Certificate. A Payment Certificate shall not be deemed to indicate the Engineer-in-charge's acceptance, approval, consent or satisfaction.</p>
Payment of an Interim Payment Certificate	15.6.1	<p>A bill shall be submitted by the Contractor each month on or before the date fixed by the Engineer-in-charge for all work executed in the previous month and the Engineer-in-charge shall take or cause to be taken or check the requisite measurement for the purpose of having the same verified and the claim, as far as admissible, authorized or paid, if possible, before the expiry of thirty days from the presentation for the bill. If the contractor does not submit the bill within the time fixed, as aforesaid, the Engineer-in-charge may depute a subordinate to measure up the said work in the presence of the Contractor, whose signature in the Measurement Book or sheet will be sufficient warrant and the Engineer-in-charge may prepare a bill from such Measurement Book, which shall be binding on the Contractor in all respects.</p>
Payment at Part Rates	15.6.2	<p>The rates for several items of works may be paid in part rates provisionally in running bills in proportion to the quantum of items executed as per specifications at the discretion of the Engineer-in-charge. The deferred payment, will however, be released after the successful completion of the item of work.</p> <p>In case of item rates, if the rate quoted for certain items is very high in comparison to the average/overall bid value over the estimated cost of the work, the payment at running stages shall not be made until an appropriate additional performance security for items for which rates have been quoted high, has been submitted by the Contractor. This security shall be refunded at the final stage of completion.</p>
Payment at Reduced Rates	15.6.3	<p>In case certain item of the Works has not been executed as per specifications, design, drawings and the specified durability and the Engineer-in-Charge is not convinced to accept the item of Works at the full rate applicable under the Contract, may accept such item at a reduced rate (in proportion to the designed and executed capability and or the designed and assessed service life of the structure and its components) with a minimum reduction of 25% of the full rate during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the whole Works. Decision of the Engineer-in-Charge to be conveyed in writing in respect of the same will be final and binding on the Contractor.</p>

Recovery of Cost of Water and Electricity consumed by the Contractor	15.6.4	The cost of all water connections necessary for the execution of Works, and the cost of water consumed and hire charges of meters and the cost of electricity consumed in connection with the execution of the Works shall be paid by the Contractor except where otherwise specifically provided in the Contract Data.
Recovery of materials issued and hire charges of Machinery and Equipment, etc.	15.6.5	Recoveries on account of materials issued to the Contractor by the Procuring Entity, Machinery and Equipment lent on hire, advance payment, secured advance, etc. or on any other account, and dues shall be made from each payment certificate from the Contractor as per conditions of this Contract.
Payment on Intermediate Certificate to be regarded as Advances	15.7	All interim payments shall be regarded as payment by way of advances against final payment only and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be rejected, removed, taken away and reconstructed or re-erected. Any certificate given by the Engineer-in-Charge relating to the work done or Materials delivered forming part of such payment may be modified or corrected by any subsequent such certificate(s) or by the final certificate and shall not by itself be conclusive evidence that any work or Materials to which it relates is/are in accordance with the Contract and Specifications. Any such interim payment, or any part thereof shall not in any respect conclude, determine or affect in any way powers of the Engineer-in-Charge under the Contract or any of such payments be treated as final settlement and adjustment of accounts or in any way vary or affect the Contract.
Application for issue of final completion certificate	15.8	The Contractor shall apply to the Engineer-in-Charge for issue of the Final Completion Certificate at least 45 days in advance of the likely date of full/ satisfactory completion. The Engineer-in-Charge during this period shall review and finalise the requirements of work to qualify as final completion with respect to the third party quality inspection agency reports, if any. The Final completion certificate shall be issued within 30 days of its becoming due as per notice.
issue of final completion certificate	15.9	After the Contractor has rectified all deficiencies pointed out by the Engineer-in-Charge in the final payment documents, and complied to all observations of the Third Party Quality Inspection Agency and the Independent Engineer to the entire satisfaction of the Engineer-in-Charge, the Contractor shall apply to the Engineer-in-Charge releasing the final payment as per final statement and also issue a final payment certificate. The Engineer-in-Charge shall proceed to issue the final payment certificate after reviewing all tests on completion, determinations, as built design and drawings, and other compliances required under the Contract.

<p>Final Statement of payments</p>	<p>15.10</p>	<p>Within 28 Days after receiving the Taking Over Certificate for the Works, the Contractor shall submit to the Engineer-in-charge, six copies of a draft final statement with as built drawings (with two soft copies also) and all other supporting documents showing in detail in a form approved by the Engineer-in-charge the value of all work done in accordance with the Contract, and any further sums which the Contractor considers to be due to him under the Contract or otherwise.</p> <p>If the Engineer-in-charge disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Engineer-in-charge may reasonably require within 28 Days from receipt of said draft and shall make such changes in the draft as may be agreed between them. The Contractor shall then prepare and submit to the Engineer-in-charge the final statement as agreed. This agreed statement is referred to in these Conditions as the "Final Statement".</p> <p>However if, following discussions between the Engineer-in-charge and the Contractor and any changes to the draft final statement which are agreed, it becomes evident that a dispute exists, the Engineer-in-charge shall deliver to the Procuring Entity's competent authority (with a copy to the Contractor) an Interim Payment Certificate for the agreed parts of the draft final statement.</p>
<p>Discharge</p>	<p>15.11</p>	<p>When submitting the Final Statement, the Contractor shall submit a discharge which confirms that the total of the Final Statement represents full and final settlement of all moneys due to the Contractor under or in connection with the Contract. This discharge may state that it becomes effective when the Contractor has received the Performance Security and the outstanding balance of this total, in which event the discharge shall be effective on such date.</p>
<p>Payment of Final Bill</p>	<p>15.12</p>	<p>The final value of the acceptable works done, less payments already received, value of claims raised and paid, value of claims not paid alongwith Interim Payment Certificates, final statement of price escalation due and paid, etc. shall be submitted by the Contractor along with the Final Bill. The final bill shall be submitted by the Contractor in the same manner as specified in interim bills within three Months of physical completion of the work or within one month of the date of the final certificate of completion issued by the Engineer-in-Charge whichever is earlier. No further claims shall be made by the Contractor after submission of the final bill and these shall be deemed to have been waived and extinguished.</p> <p>Payments of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by Engineer-in-Charge, will, as far as possible be made within a period of 90 days, the period being reckoned from the date of receipt of the bill</p>

		by the Engineer-in-Charge complete with accounts of advances, Materials issued, Machinery & Equipment lent on hire by the Procuring Entity, dismantled Materials, etc.
Recovery of cost of preparation of the bill	15.13	<p>In case the Contractor does not submit the bill within the time fixed, the Engineer-in-charge may prepare the bill as per provision of Sub-Clause 15.6.1 [Payment of an Interim Payment Certificate] but a deduction @ 0.5 % of the amount of such a bill shall be made and credited to the general revenue account of the Department/ Organisation on account of preparation of the bill.</p> <p>The Contractor shall submit all bills on the printed forms, to be had on application, at the office of the Engineer- in-charge and the charges in the bills shall always be entered at the rates specified in the Contract or in the case of any extra work ordered in pursuance of these conditions, and not mentioned or provided for in the Contract, at the rates approved for such work.</p>
Payment of Contractor's Bills to Banks	15.14	<p>Payments due to the Contractor may, if so desired by him, be made to his Bank instead of direct to him provided that the Contractor furnishes to the Engineer-in-Charge (i) the account number with name and address of branch of the Bank, (ii) an authorization in the form of a legally valid document such as a power of attorney conferring authority on the Bank to receive payments, and (iii) his own acceptance of the correctness of the amount made out as being due to him by Procuring Entity or his signature on the bill or other claim preferred against Procuring Entity before settlement by the Engineer-in-Charge of the account or claim by payment to the Bank. While the receipt given by such copy of Banks statement shall constitute a full and sufficient discharge for the payment, the Contractor shall also acknowledge with a receipt. Wherever possible the Contractor shall present his bills duly receipted and discharges through his Bankers.</p> <p>Nothing herein contained shall operate to create in favour of the Bank any rights or equities vis.-a-vis. the Procuring Entity/ Governor of Rajasthan.</p>
Advance Payments	15.15	<p>If provided in the SCC/ Contract Data, the Procuring Entity shall make an advance payment on simple interest (rate as specified in SCC) as an mobilization for the Works, when the Contractor submits a Bank Guarantee of an equal amount from a Scheduled Bank in India. The total advance payment, the number and timing of installments (if more than one), and the applicable currencies and proportions, shall be as stated in the Contract Data.</p> <p>Unless and until the Procuring Entity receives this Bank Guarantee and got confirmed from the issuing Bank, or if the provision of advance payment is not stated in the Contract Data, this Sub-Clause shall not apply.</p>

		<p>Unless stated otherwise in the Contract Data, the advance payment shall be repaid through percentage deductions from the interim payments determined by the Engineer-in-charge in accordance with Sub-Clause 15.5 [Issue of Interim Payment Certificates], as follows</p> <p>i. deductions shall commence in the next interim Payment Certificate following that in which the total of all certified interim payments (excluding the advance payment and deductions and repayments of retention) exceeds 30 percent of the Accepted Contract Amount less Provisional Sums; and</p> <p>ii. deductions shall be made at the amortisation rate stated in the Contract Data of the amount of each Interim Payment Certificate (excluding the advance payment and deductions for its repayments as well as deductions for retention money) in the currencies and proportions of the advance payment until such time as the advance payment has been repaid; provided that the advance payment shall be completely repaid prior to the time when 90 percent of the Accepted Contract Amount less Provisional Sums has been certified for payment.</p> <p>If the advance payment has not been repaid prior to the issue of the Taking-Over Certificate for the Works or prior to termination under Sub-Clause 16.1 [Termination by Procuring Entity], Sub-Clause 17.2 [Termination by Contractor] or Sub-Clause 19 [Force Majeure] (as the case may be), the whole of the balance then outstanding shall immediately become due to the Procuring Entity.</p>
<p>Secured Advance on Non-Perishable Materials</p> <p><i>(Not applicable in case of Lump Sum Contract)</i></p>	15.16	<p>The Contractor, on signing an indenture in the form to be specified by the Engineer-in-Charge, may be paid during the progress of the execution of the work, up to 75% of the assessed value of any Materials which have been actually brought at the Site and which, in the opinion of the Engineer-in-charge, are non-perishable, non-fragile and non-combustible and will be consumed in the Works within next three months in accordance with the construction programme and the Contract provided that they are adequately stored and/ or protected against damage by weather or other causes but which have not, at the time of granting advance, been incorporated in the Works. When Materials on account of which advance has been made under this Sub-Clause are incorporated in the work, the amount of such advance shall be recovered/ deducted from the next payment made under any of the Sub-Clauses of this Contract.</p>
<p>Ensuring Payment and Amenities to Workers if Contractor fails to pay</p>	15.17	<p>In every case in which by virtue of the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and of the Contract Labour (Regulation and Abolition) Central Rules, 1971, any applicable Labour Laws, the Procuring Entity is obliged to pay any amounts of wages to a workman employed by the Contractor in execution of the Works, or to incur any expenditure in providing welfare and</p>

		<p>health amenities required to be provided under the above said Laws or under the P.W.D. Contractor's Labour Regulations, or under the Rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by the Contractor, the Procuring Entity shall recover from the Contractor the amount of wages so paid or the amount of expenditure so incurred; and without prejudice to the rights of the Procuring Entity under sub-section (2) of Section 20, and sub-section (4) of Section 21, of the Contract Labour (Regulation and Abolition) Act, 1970, Government shall be at liberty to recover such amount or any part thereof by deducting it from the Performance Security or from any sum due by the Procuring Entity to the Contractor whether under this Contract or otherwise. The Procuring Entity shall not be bound to contest any claim made against it under sub-section (1) of Section 20, sub-section (4) of Section 21, of the said Act, except on the written request of the Contractor and upon his giving to the Procuring Entity full security for all costs for which the Procuring Entity might become liable in contesting such claim.</p>
<p>Withholding and lien in respect of sums due from Contractor</p>	<p>15.18</p>	<p>i. Whenever any claim or claims for payment of a sum of money arises out of or under the Contract or against the Contractor, the Engineer-in-Charge or the Government shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the Performance Security, if any, deposited by the Contractor and for the purpose aforesaid, the Engineer-in-Charge or the Government shall be entitled to withhold the Performance Security furnished, if any and also have a lien over the same pending finalization or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the Contractor, the Engineer-in-Charge or the Government shall be entitled to withhold and have a lien to retain to the extent of payable or which may at any time thereafter become payable to the Contractor under the same Contract or any other Contract with the Engineer-in-Charge or the Government or any Contracting person through the Engineer-in-Charge pending finalization of adjudication of any such claim. It is an agreed term of the Contract that the sum of money or moneys so withheld or retained under the lien referred to above by the Engineer-in-Charge or Government will be kept withheld or retained as such by the Engineer-in-Charge or Government till the claim arising out of or under the Contract is determined by the arbitrator (if the Contract is governed by the arbitration Sub-Clause) or by the competent court, as the case may be and that the Contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to above</p>

		<p>and duly notified as such to the Contractor. For the purpose of this Sub-Clause, where the Contractor is a partnership firm or a limited company, the Engineer-in-Charge or the Government shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/ limited company as the case may be, whether in his individual capacity or otherwise.</p> <p>ii. The Procuring Entity shall have the right to cause an audit and technical examination of the Works and the final bills of the Contractor including all supporting vouchers, abstract etc., to be made within two years after payment of the final bill and if as a result of such audit and technical examination any sum is found to have been overpaid in respect of any work done by the Contractor under the Contract or any work claimed to have been done by him under the Contract and found not to have been executed, the Contractor shall be liable to refund the amount of over-payment and it shall be lawful for the Procuring Entity to recover the same from him in the manner prescribed or in any other manner legally permissible; and if it is found that the Contractor was paid less than what was due to him under the Contract in respect of any work executed by him under it, the amount of such under payment shall be duly paid by the Procuring Entity to the Contractor, without any interest thereon whatsoever.</p>
<p>Lien in respect of claims in other Contracts</p>	<p>15.19</p>	<p>Any sum of money due and payable to the Contractor (including the Performance Security returnable to him) under the Contract may be withheld or retained by way of lien by the Engineer-in-Charge or the Government or any other Contracting person or persons through Engineer-in-charge against any claim of the Engineer-in-Charge or the Government or such person or persons in respect of payment of a sum of money arising out of or under any other Contract made by the Contractor with the Engineer-in-Charge or the Government or with such person or persons.</p> <p>It is an agreed term of the Contract that the sum of money so withheld or retained under this Sub-Clause by the Engineer-in- Charge or the Government will be kept withheld or retained as such by the Engineer-in-Charge or the Government till his claim arising out of the same Contract or any other Contract is either mutually settled or determined by the arbitration Sub-Clause or by the competent court, as the case may be and that the Contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this Sub-Clause and duly notified as such to the Contractor.</p>

<p>Levy or Taxes payable by Contractor</p>	<p>15.20</p>	<p>i. VAT/ Sales Tax , service tax or any other taxes and duties on Materials, works or services in respect of this Contract shall be payable by the Contractor according to Law in effect.</p> <p>ii. The Contractor shall deposit royalty and obtain necessary permit for supply of the red earth, moorum, sand, chips, bajri, stone, kankar, etc. from local authorities. The liability, if any, on account of quarry fees, royalties, octroi and other taxes and duties in respect of materials actually consumed on the Works, shall be borne by the Contractor.</p> <p>iii. If pursuant to or under any Law, notification or order any royalty, cess or the hike becomes payable to the Government of India and does not at any time become payable by the Contractor to the State Government/ Local authorities in respect of any Material used by the Contractor in the Works then in such a case, it shall be Lawful to the Government of India and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from the dues of the Contractor.</p> <p>iv. In respect of goods and Materials procured by the Contractor, for use in Works under the Contract, VAT will be paid by the Contractor himself but in respect of such goods manufactured and supplied by the Contractor and Works executed under the contract, the responsibility of payment of VAT shall be that of the Procuring Entity.</p>
<p>Adjustments for changes in Legislation</p>	<p>15.21</p>	<p>i. All the bid rates shall be inclusive of all taxes and levies payable under respective statutes, However if any further tax or levy is imposed by Statute, after the Base Date and the Contractor thereupon necessarily and properly pays such taxes/ levies the Contractor shall be reimbursed the amount so paid, provided such payments, if it any, is not, in the opinion of the Procuring Entity (whose decision shall be final and binding on the Contractor) attributable to delay in execution of work within the control of the Contractor.</p> <p>ii. The Contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorized representative of the Procuring Entity and/ or the Engineer-in-Charge and further shall furnish such other information/ document as the Engineer-in-Charge may require from time to time.</p> <p>iii. The Contractor shall, within a period of 30 Days of the imposition of any such further tax or levy, give a written notice thereof to the Engineer-in-Charge that the same is given pursuant to this condition, together with all necessary information relating thereto.</p> <p>This Sub-Clause shall not be applicable if the effect of</p>

		changes in legislation has been included in price variation formulae in Clause 10 [Price Variation].
Pre Check and Post Check of Bills	15.22	The Government/ Procuring Entity shall have a right to provide a system of pre check of Contractor's bills by a specified organization and payment by an Accounts Organisation as the Government/ Procuring Entity may in its absolute discretion decide. Any overpayments detected as a result of such pre check or post check of Contractor's bills can be recovered from the Contractor's bills and the Contractor will refund such excess payments.
16. Termination of Contract by Procuring Entity		
Termination by Procuring Entity	16.1	<p>Subject to the other provisions contained in this Sub-Clause the Engineer-in-charge may, without prejudice to his any other rights or remedy against the Contractor in respect of any delay, inferior workmanship, any claims for damages and/or any other provisions of this Contract or otherwise and whether the date of completion has or has not elapsed by a notice of reasonable period in writing absolutely determine the Contract in any of the following cases:</p> <ul style="list-style-type: none"> i. If the Contractor, having been given by the Engineer-in-Charge a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or un-workmanlike manner, or by workers who do not understand the instructions of the Engineer-in-Charge, or do not execute the work as per specifications or in contravention of the advice of the third party quality inspections agency about the quality of works, if any, shall omit to comply with the requirement of such notice for a period of fifteen Days thereof. ii. If the Contractor being a company shall pass a resolution or the Court shall make an order that the company shall be wound up or if a receiver or a manager on behalf of a creditor shall be appointed or if circumstances shall arise which entitle the Court or the creditor to appoint a receiver or a manager or which entitle the Court to make a winding up order. iii. If the Contractor has, without reasonable cause, suspended the progress of the Works for a continuous period of 30 days, or has failed to proceed with the Works with due diligence so that, in the reasoned opinion of the Engineer-in-Charge (which shall be final and binding), he will be unable to secure completion of the Works by the stipulated date of completion and continues to do so after a notice in writing of fifteen Days from the Engineer-in-Charge. iv. If the Contractor fails to complete the Works within the stipulated time or spans of the Works with individual date of completion, if any stipulated, on or before such

	<p>date(s) of completion and or fails to achieve two continuous mile stones, does not complete them within the period specified in a notice given in writing on that behalf by the Engineer-in-Charge.</p> <p>v. If the Contractor persistently neglects to carry out his obligations under the Contract and/ or commits default in complying with any of the terms and conditions of the Contract and does not remedy it or take effective steps to remedy it within fifteen Days after a notice in writing is given to him on that behalf by the Engineer-in-charge.</p> <p>vi. If the Contractor sublets the Works or a part of Works without specific permission of the Procuring Entity/ Engineer-in-charge.</p> <p>vii. If the Contractor has not been commenced the Works by the Commencement Date or within 1/8th of the stipulated time for completion subject to a maximum of 45 Days, whichever is earlier.</p> <p>When the Contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge on behalf of the Procuring Entity shall have the powers:</p> <p>(a) To determine or rescind the Contract as aforesaid (of which a 28 days termination or rescission notice in writing to the Contractor under the hand of Engineer-in-Charge shall be conclusive evidence). Upon such determination or rescission the Bid Security and Performance Security under the Contract shall be liable to be forfeited and shall be absolutely at the disposal of the Procuring Entity.</p> <p>(b) To employ labour paid by the Procuring Entity and to supply materials to carry out the Works or any part of the Works, debiting the Contractor with the cost of the labour and the price of the materials (of the amount of which cost and price certified by the Engineer-in-charge shall be final and conclusive against the Contractor) and crediting him with the value of the work done in all respects in the same manner and at the same rates, as if it has been carried out by the Contractor under the terms of this Contract. The certificate of the Engineer-in-Charge, as to the value of the work done, shall be final and conclusive evidence against the Contractor provided always that action under the sub Sub-Clause shall only be taken after giving notice in writing to the Contractor. Provided also that if the expenses incurred by the Procuring Entity are less than the amount payable to the Contractor at his agreement rates, the difference shall not be paid to the Contractor.</p> <p>(c) After giving notice specifying the date and time to the Contractor to measure up the acceptable (executed as per design, drawings and specifications) work of the Contractor at Site and to take such part thereof, as shall be unacceptable out of his hands and to give it to</p>
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		<p>another contractor to complete, in which case any expenses which may be incurred in excess of the sum which would have been paid to the original Contractor, if the whole work had been executed by him (of the amount of which excess, the certificate in writing of the Engineer-in-charge shall be final and conclusive) shall be borne and paid by the original Contractor and may be deducted from any money due to him by the Procuring Entity under this Contract or any other account, whatsoever, or from his Bid Security, Performance Security or the Enlistment Security or the proceeds of sale thereof, or a sufficient part thereof as the case may be.</p> <p>In the event of any one or more of the above courses being adopted by the Engineer-in-charge the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the Works or the performance of the Contract.</p> <p>In case action is taken under any of the aforesaid provisions, the Contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this Contract unless and until the Engineer-in-charge has certified in writing the performance of such work and value payable in respect thereof and he shall only be entitled to be paid the value so certified.</p>
<p>Contractor liable to pay compensation even if action not taken under Sub-Clause 16.1 above</p>	<p>16.2</p>	<p>(i) In any case in which the powers conferred upon the Engineer- in-Charge by Sub-Clause 16.1 [Termination by Procuring Entity] shall have become exercisable and the same are not exercised, the non-exercise of such powers shall not constitute a waiver of any of the conditions hereof and such powers shall, notwithstanding, be exercisable in the event of any future case of default by the Contractor and the liability of the Contractor for compensation shall remain unaffected.</p> <p>(ii) In the event of the Engineer-in-Charge putting in force all or any of the powers vested in him under the preceding Sub-Clause 16.1, he may, if he so desires, after giving a notice in writing to the Contractor, take possession of all or any tools, plants, materials and stores, in or upon the Works or the Site, thereof or belonging to the Contractor or procured by him and intended to be used for execution of the Works or any part thereof, paying or allowing for the same in account, at the Contract rates or, in the case of these not being applicable, at current market rates to be certified by the Engineer-in-Charge (whose certificate, thereof, shall be final and conclusive), otherwise the Engineer-in-Charge may, by notice in writing to the Contractor or his authorized agent, require him to remove such tools, plants, materials or stores from the</p>

		<p>premises (within a time to be specified in such notice), and in the event of the Contractor failing to comply with any such requisition, the Engineer-in-Charge may remove them at the Contractor's expense or sell them by auction or private sale on account of the Contractor and his risk in all respects, and the certificate of the Engineer-in-Charge as to the expenses of any such removal, and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the Contractor.</p>
Valuation at the date of termination:	16.3	<p>As soon as practicable after a notice of termination under Sub-Clause 16.1 has taken effect, the Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the value of the Works, Goods and Contractor's Documents, and any other sums due to the Contractor for work executed in accordance with the Contract.</p>
Payment after Termination	16.4	<p>After a notice of termination under Sub-Clause 16.1 has taken effect, the Procuring Entity may:</p> <ol style="list-style-type: none"> i. proceed in accordance with Sub-Clause 3.5 [Procuring Entity's Claims], ii. withhold further payments to the Contractor until the Costs of execution, completion and remedying of any Defects, damages for delay in completion (if any), and all other Costs incurred by the Procuring Entity, have been established, and iii. recover from the Contractor any losses and damages incurred by the Procuring Entity and any extra Costs of completing the Works, after allowing for any sum due to the Contractor under Sub-Clause 16.3. After recovering any such losses, damages and extra Costs, the Procuring Entity shall pay balance to the Contractor, if any.
Procuring Entity's Entitlement to Termination for Convenience	16.5	<p>If, at any time after the commencement of the Works, the Government/ Procuring Entity shall, for any reason, whatsoever, not require the whole work, thereof, as specified in the Contract, to be carried out, the Engineer-in-charge shall give notice, in writing, of the fact to the Contractor, who shall have no claim to any payment or compensation, whatsoever, on account of any profit or advantage which he might have derived from the execution of the Works in full but which he did not derive in consequence of the full amount of the Works not having been carried out. Neither shall he have any claim for compensation by reason of alterations having been made in the original specifications, drawings and design and instructions, which shall involve any curtailment of the Works, as originally contemplated. Provided, that the contractor shall be paid the charges for the cartage only, of materials actually brought to the Site of the Works by him for bonafide use and rendered surplus as a result of the</p>

		abandonment or curtailment of the Works or any portion thereof, and taken them back by the Contractor provided, however, that the Engineer-in-charge shall have, in all such cases, the option of taking over all or any such materials at their purchase price or at local market rates whichever may be less.
Corrupt, Fraudulent, Collusive or Coercive Practices	16.6	<p>If the Procuring Entity determines that the Contractor, his Sub-Contractors or any of their personnel has breached the Code of Integrity prescribed in the Act, the Rules, or the Instructions to Bidders [Section I of the Bidding Document] or has engaged in corrupt, fraudulent, collusive or coercive practices, in competing for or in executing the Contract, then the Procuring Entity may, after giving 14 Days notice to the Contractor:</p> <ul style="list-style-type: none"> i. terminate the Contract and expel him from the Site, ii. forfeit or encash performance security and any other security or bond relating to this Contract, iii. recover the payments made under the Contract alongwith interest thereon at bank rate, iv. recover compensation for loss incurred due to termination of the Contract including excess expenditure, if any incurred in getting the remaining work executed from other agency under Sub-Clause 16.1. <p>For the purposes of this Sub-Clause:</p> <ul style="list-style-type: none"> i. “corrupt practice” means the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence the action of a public official in the procurement process or in the Contract execution; ii. “fraudulent practice” means a misrepresentation or omission of facts in order to influence a procurement process or the execution of the Contract; iii. “collusive practice” means a scheme of arrangement between two or more bidders, with or without the knowledge of the Procuring Entity, designed to establish bid prices at artificial, non-competitive levels; iv. “Coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the procurement process or affect the execution of a Contract. <p>Should any employee of the Contractor be determined to have engaged in corrupt, fraudulent or coercive practice during the execution of the Works then that employee shall be removed in accordance with Sub-Clause 6.11 [Contractor’s Personnel].</p>

Termination of Contract on death of Contractor	16.7	Without prejudice to any of the rights or remedies under this Contract, if the Contractor dies, the Procuring Entity shall have the option of terminating the Contract without compensation to the Contractor after the affidavit of his/ their legal heir/heirs that they are not in a position to complete the work as Contracted or are not going to be in this profession in future.
17. Suspension of Works and Termination by the Contractor		
Contractor's Entitlement to Suspend Work	17.1	<p>If the Engineer-in-charge fails to certify an Interim Payment Certificate in accordance with Sub-Clause 15.5 [Issue of Interim Payment Certificates] or fails to make a payment of an Interim Payment Certificate within time period specified in accordance with Sub-Clause 15.6 [Payment of an Interim Payment Certificate], the Contractor may, after giving not less than 21 Days' notice to the Procuring Entity, suspend work (or reduce the rate of progress of work) unless and until the Contractor has received the Payment Certificate or payment, as the case may be as described in the notice.</p> <p>If the Contractor subsequently receives such Payment Certificate or payment (as described in the relevant Sub-Clause and in the above notice) before giving a notice of termination, the Contractor shall resume normal working as soon as is reasonably practicable.</p> <p>If the Contractor suffers delay and/ or incurs Cost as a result of suspending the Works (or reducing the rate of progress of the Works) in accordance with this Sub-Clause, the Contractor shall give notice to the Engineer-in-charge and shall be entitled subject to Sub-Clause 21.2 [Contractor's Claims] to:</p> <ul style="list-style-type: none"> i. an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.6 [Extension of Time for Completion], and ii. payment of any such Cost, which shall be included in the Contract Price. <p>After receiving this notice, the Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p>
Termination by Contractor	17.2	<p>The Contractor shall be entitled to terminate the Contract if:</p> <ul style="list-style-type: none"> i. the Contractor does not receive the amount due under an Interim Payment Certificate within 28 Days after the expiry of the time stated in Sub-Clause 15.6 [Payment of an Interim Payment Certificate] within which payment is to be made (except for deductions in accordance with Sub-Clause 2.5 [Procuring Entity's Claims], or ii. the Procuring Entity substantially fails to perform his obligations under the Contract in such manner as to

		<p>materially and adversely affect the economic balance of the Contract and/ or the ability of the Contractor to perform the Contract, or</p> <p>iii. a prolonged suspension affects the whole of the Works as described in Sub-Clause 8.13 [Prolonged Suspension], or</p> <p>iv. the Contractor does not receive the Engineer-in-charge's instruction recording the agreement of both Parties on the fulfillment of the conditions for the Commencement of Works under Sub-Clause 8.3 [Commencement of Works].</p> <p>In any of these events or circumstances, the Contractor may, upon giving 28 Days' reasoned notice to the Procuring Entity, terminate the Contract.</p>
Cessation of Work and Removal of Contractor's Equipment	17.3	<p>After a notice of termination under Sub-Clause 16 [Termination of Contract by Procuring Entity], Sub-Clause 17.2 [Termination by Contractor] or Sub-Clause 19.6. [Optional Termination, Payment and Release] has taken effect, the Contractor shall promptly:</p> <p>i. cease all further work, except for such work as may have been instructed by the Engineer-in-charge for the protection of life or property or for the safety of the Works,</p> <p>ii. hand over Contractor's Documents, as built drawings, Plant, Materials and other work, for which the Contractor has received payment, and</p> <p>iii. remove all other Goods from the Site, except as necessary for safety, and leave the Site.</p>
Payment on Termination	17.4	<p>After a notice of termination under Sub-Clause 17.2 [Termination by Contractor] has taken effect, the Procuring Entity shall promptly pay the Contractor in accordance with Sub-Clause 19.6. [Optional Termination, Payment and Release].</p>
18. Risk and responsibilities		
Indemnities	18.1	<p>The Contractor shall indemnify and hold harmless the Procuring Entity, the Procuring Entity's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of:</p> <p>i. bodily injury, sickness, disease or death, of any person whatsoever arising out of or in the course of or by reason of the Contractor's design (if any), the execution and completion of the Works and the remedying of any Defects, unless attributable to any negligence, willful act or breach of the Contract by the Procuring Entity, the Procuring Entity's Personnel, or any of their respective agents, and</p>

		<p>ii. damage to or loss of any property, real or personal (other than the Works), to the extent that such damage or loss arises out of or in the course of or by reason of the Contractor's design (if any), the execution and completion of the Works and the remedying of any Defects, unless and to the extent that any such damage or loss is attributable to any negligence, willful act or breach of the Contract by the Procuring Entity, the Procuring Entity's Personnel, their respective agents, or anyone directly or indirectly employed by any of them.</p>
Contractor's Care of the Works	18.2.1	<p>The Contractor shall take full responsibility for the care of the Works and materials and Goods from the Commencement Date until the Taking-Over Certificate is issued (or is deemed to be issued under Clause 12 [Taking Over of the Works and Sections by Procuring Entity] for the Works, when responsibility for the care of the Works shall pass to the Procuring Entity. If a Taking-Over Certificate is issued (or is so deemed to be issued) for any Section or part of the Works, responsibility for the care of the Section or part shall then pass to the Procuring Entity.</p> <p>After responsibility has accordingly passed to the Procuring Entity, the Contractor shall take responsibility for the care of any work which is outstanding on the date stated in a Taking-Over Certificate, until this outstanding work has been completed.</p> <p>If any loss or damage happens to the Works, Materials or Goods or Contractor's Documents during the period when the Contractor is responsible for their care, from any cause not listed in Sub-Clause 18.3 [Procuring Entity's Risks], the Contractor shall rectify/ reimburse the loss or damage at the Contractor's risk and Cost, so that the Works, Materials or Goods or Contractor's Documents conform with the Contract.</p> <p>The Contractor shall be liable for any loss or damage caused by any actions performed by the Contractor after a Taking-Over Certificate has been issued. The Contractor shall also be liable for any loss or damage which occurs after a Taking Over Certificate has been issued and which arose from a previous event for which the Contractor was liable.</p>
	18.2.2	<p>All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.</p>
Procuring Entity's Risks.	18.3	<p>The risks referred to in Sub-Clause 18.4 [Consequences of Procuring Entity's Risks] below, insofar as they directly affect the execution of the Works, are:</p> <p>i. war, hostilities (whether war be declared or not), invasion, act of foreign enemies,</p>

		<ul style="list-style-type: none"> ii. rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war, within the Country, iii. riot, commotion or disorder within the Country by persons other than the Contractor's Personnel, iv. munitions of war, explosive Materials, ionizing radiation or contamination by radio-activity, within the Country, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, v. pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds, vi. use or occupation by the Procuring Entity of any part of the Permanent Works, except as may be specified in the Contract, vii. design of any part of the Works by the Procuring Entity's Personnel or by others for whom the Procuring Entity is responsible, and viii. Any operation of the forces of nature which is Unforeseeable or against which an experienced Contractor could not reasonably have been expected to have taken adequate preventive precautions.
Consequences of Procuring Entity's Risks	18.4	<p>If and to the extent that any of the risks listed in Sub-Clause 18.3 above results in loss or damage to the Works, materials or Goods or Contractor's Documents, the Contractor shall promptly give notice to the Engineer-in-charge and shall rectify this loss or damage to the extent required by the Engineer-in-charge.</p> <p>If the Contractor suffers delay and/ or incurs Cost from rectifying this loss or damage, the Contractor shall give a further notice to the Engineer-in-charge and shall be entitled subject to Clause 21.2 [Contractor's Claims] to:</p> <ul style="list-style-type: none"> i. An extension of time for any such delay, if completion is or will be delayed, under Clause 8.6 [Extension of Time for Completion], and ii. payment of any such Cost, which shall be included in the Contract Price. <p>After receiving this further notice, the Engineer-in-charge shall proceed in accordance with Clause 3.5 [Determinations] to agree or determine these matters.</p>
Intellectual and Industrial Property Rights	18.5	<p>In this Sub-Clause, "infringement" means an infringement (or alleged infringement) of any patent, registered design, copyright, trade mark, trade name, trade secret or other intellectual or industrial property right relating to the Works; and "claim" means a claim (or proceedings pursuing a claim) alleging an infringement.</p> <p>Whenever a Party does not give notice to the other Party of any claim within 28 Days of receiving the claim, the first</p>

		<p>Party shall be deemed to have waived any right to indemnity under this Sub-Clause.</p> <p>The Contractor shall fully indemnify and keep indemnified the Procuring Entity and the State Government against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the Contract. The Contractor shall indemnify and hold the Procuring Entity harmless against and from any other claim which arises out of or in relation to (i) the manufacture, use, sale or import of any Goods, or (ii) any design for which the Contractor is responsible.</p> <p>The Procuring Entity shall indemnify and hold the Contractor harmless against and from any claim alleging an infringement which is or was:</p> <ul style="list-style-type: none"> i. an unavoidable result of the Contractor's compliance with the Contract, or ii. a result of any Works being used by the Procuring Entity: <ul style="list-style-type: none"> (a) for a purpose other than that indicated by, or reasonably to be inferred from, the Contract, or (b) in conjunction with anything not supplied by the Contractor, unless such use was disclosed to the Contractor prior to the Base Date or is stated in the Contract <p>If a Party is entitled to be indemnified under this Sub-Clause, the indemnifying Party may (at its Cost) conduct negotiations for the settlement of the claim, and any litigation or arbitration which may arise from it. The other Party shall, at the request and Cost of the indemnifying Party, assist in contesting the claim. This other Party (and its Personnel) shall not make any admission which might be prejudicial to the indemnifying Party, unless the indemnifying Party failed to take over the conduct of any negotiations, litigation or arbitration upon being requested to do so by such other Party.</p>
<p>Limitation of Liability</p>	<p>18.6</p>	<p>Neither Party shall be liable to the other Party for loss of use of any Works, loss of profit, loss of any Contract or for any indirect or consequential loss or damage which may be suffered by the other Party in connection with the Contract, other than as specifically provided in Sub-Clause 8.9 [Compensation/ Damages for Delay]; Sub-Clause 13.3 [Cost of Remedying Defects]; Sub-Clause 16.4 [Payment after Termination]; Sub-Clause 17.4 [Payment on Termination]; Sub-Clause 18.1 [Indemnities]; Sub-Clause 18.2 [Contractor's Care of the Works], Sub-Clause 18.4 [Consequences of Procuring Entity's Risks] and Sub-Clause 18.5. [Intellectual and Industrial Property Rights].</p> <p>The total liability of the Contractor to the Procuring Entity, under or in connection with the Contract shall not exceed</p>

		<p>twice the Accepted Contract Amount. This amount does not include charges, if any, for consumption of Electricity, Water and Gas provided by the Procuring Entity under Sub-Clause 4.18 [Electricity, Water and Gas], and use of Procuring Entity's Equipment and Materials under Sub-Clause 4.19 [Procuring Entity's Equipment and Issue of Materials].</p> <p>This Sub-Clause shall not limit liability of the Contractor in any case of fraud, deliberate default or reckless misconduct by the Contractor or Sub-Contractors or their personnel or offences under any other Law for the time being in force.</p>
Use of Procuring Entity's Accommodation/ Facilities	18.7	<p>The Contractor shall take full responsibility for the care of the accommodation and facilities, if any, provided by the Procuring Entity as detailed in the Specifications, from the respective dates of hand-over to the Contractor until cessation of occupation (where hand-over or cessation of occupation may take place after the date stated in the Taking-Over Certificate for the Works).</p> <p>If any loss or damage happens to any of the above items while the Contractor is responsible for their care arising from any cause whatsoever other than those for which the Procuring Entity is liable, the Contractor shall, at his own cost, rectify the loss or damage to the satisfaction of the Engineer-in-Charge.</p>
19. Force Majeure		
Definition of Force Majeure	19.1	<p>In this Sub-Clause, "Force Majeure" means an exceptional event or circumstance:</p> <ol style="list-style-type: none"> i. which is beyond a Party's control, ii. which such Party could not reasonably have provided against before entering into the Contract, iii. which, having arisen, such Party could not reasonably have avoided or overcome, and iv. which is not substantially attributable to the other Party. <p>Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (i) to (iv) above are satisfied:</p> <ol style="list-style-type: none"> (a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies, (b) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war, (c) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel, (d) munitions of war, explosive Materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions,

		explosives, radiation or radio-activity, and (e) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.
Notice of Force Majeure	19.2	<p>If a Party is or will be prevented from performing its substantial obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 Days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.</p> <p>The Party shall, having given notice, be excused performance of its obligations for so long as such Force Majeure prevents it from performing them.</p> <p>Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.</p>
Duty to Minimize Delay	19.3	<p>Each Party shall at all times use all reasonable endeavors to minimize any delay in the performance of the Contract as a result of Force Majeure.</p> <p>A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.</p>
Consequences of Force Majeure	19.4	<p>If the Contractor is prevented from performing its substantial obligations under the Contract by Force Majeure of which notice has been given under Sub-Clause 19.2 [Notice of Force Majeure], and suffers delay and/ or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to Sub-Clause 21.2 [Contractor's Claims] to:</p> <ol style="list-style-type: none"> i. an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.6 [Extension of Time for Completion], and ii. if the event or circumstance is of the kind described in Sub-Clause 19.1 [Definition of Force Majeure] and, in the case of sub-paragraphs (a) to (e), occurs in the Country, payment of any such Cost incurred rectifying or replacing the Works and/ or Goods damaged or destructed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in Sub-Clause 20.2 [Insurance for Works and Contractor's Equipment]. <p>After receiving this notice, the Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p>
Force Majeure Affecting Subcontractor	19.5	<p>If any Subcontractor is entitled under any Contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Sub-Clause, such additional or broader</p>

		force majeure events or circumstances shall not excuse the Contractor's non-performance or entitle him to relief under this Sub-Clause.
Optional Termination, Payment and Release	19.6	<p>If the execution of substantially all the Works in progress is prevented for a continuous period of 84 Days by reason of Force Majeure of which notice has been given under Sub-Clause 19.2 [Notice of Force Majeure], or for multiple periods which total more than 140 Days due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 Days after the notice is given, and the Contractor shall proceed in accordance with Sub-Clause 17.3 [Cessation of Works and Removal of Contractor's Equipment].</p> <p>Upon such termination, the Engineer-in-charge shall determine the value of the work done and issue a Payment Certificate which shall include:</p> <ul style="list-style-type: none"> i. the amounts payable for any acceptable work carried out for which a price is stated in the Contract; ii. the Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Procuring Entity when paid for by the Procuring Entity, and the Contractor shall place the same at the Procuring Entity's disposal; iii. other Costs or liabilities which in the circumstances were reasonably and necessarily incurred by the Contractor in the expectation of completing the Works; iv. the Cost of removal of Temporary Works and Contractor's Equipment from the Site.
Release from Performance	19.7	<p>Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises which makes it impossible or unlawful for either or both Parties to fulfill its or their Contractual obligations or which, under the Law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party to the other Party of such event or circumstance:</p> <ul style="list-style-type: none"> i. The Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract, and ii. the sum payable by the Procuring Entity to the Contractor shall be the same as would have been payable under Sub-Clause 19.6 [Optional Termination, Payment and Release] if the Contract had been terminated under Sub-Clause 19.6.

20. Insurance

General Requirements for Insurance

20.1

In this Sub-Clause, “insuring Party” means, for each type of insurance, the Party responsible for effecting and maintaining the insurance specified in the relevant Sub-Clause.

Wherever the Contractor is the insuring Party, each insurance shall be effected with insurers and in terms approved by the Procuring Entity. These terms shall be consistent with any terms agreed by both Parties before the date of the Letter of Acceptance. This agreement of terms shall take precedence over the provisions of this Sub-Clause.

Wherever the Procuring Entity is the insuring Party, each insurance shall be effected with insurers and in terms acceptable to the Contractor. These terms shall be consistent with any terms agreed by both Parties before the date of the Letter of Acceptance. This agreement of terms shall take precedence over the provisions of this Sub-Clause.

If a policy is required to indemnify joint insured, the cover shall apply separately to each insured as though a separate policy had been issued for each of the joint insured. If a policy indemnifies additional joint insured, namely in addition to the insured specified in this Sub-Clause, (i) the Contractor shall act under the policy on behalf of these additional joint insured except that the Procuring Entity shall act for Procuring Entity’s Personnel, (ii) additional joint insured shall not be entitled to receive payments directly from the insurer or to have any other direct dealings with the insurer, and (iii) the insuring Party shall require all additional joint insured to comply with the conditions stipulated in the policy.

Each policy insuring against loss or damage shall provide for payments to be made in the currencies required to rectify the loss or damage. Payments received from insurers shall be used for the rectification of the loss or damage.

The relevant insuring Party shall, within the respective periods stated in the Contract Data (calculated from the Commencement Date), submit to the other Party:

- i. evidence that the insurances described in this Sub-Clause have been effected, and
- ii. copies of the policies for the insurances described in Sub-Clause 20.2 [Insurance for Works and Contractor’s Equipment] and Sub-Clause 20.3 [Insurance against Injury to Persons and Damage to Property].

When each premium is paid, the insuring Party shall submit evidence of payment to the other Party. Whenever evidence or policies are submitted, the insuring Party shall also give notice to the Engineer-in-charge.

		<p>Each Party shall comply with the conditions stipulated in each of the insurance policies. The insuring Party shall keep the insurers informed of any relevant changes to the execution of the Works and ensure that insurance is maintained in accordance with this Sub-Clause.</p> <p>Neither Party shall make any material alteration to the terms of any insurance without the prior approval of the other Party. If an insurer makes (or attempts to make) any alteration, the Party first notified by the insurer shall promptly give notice to the other Party.</p> <p>If the insuring Party fails to effect and keep in force any of the insurances it is required to effect and maintain under the Contract, or fails to provide satisfactory evidence and copies of policies in accordance with this Sub-Clause, the other Party may (at its option and without prejudice to any other right or remedy) effect insurance for the relevant coverage and pay the premiums due. The insuring Party shall pay the amount of these premiums to the other Party, and the Contract Price shall be adjusted accordingly.</p> <p>Nothing in this Sub-Clause limits the obligations, liabilities or responsibilities of the Contractor or the Procuring Entity, under the other terms of the Contract or otherwise. Any amounts not insured or not recovered from the insurers shall be borne by the Contractor and/ or the Procuring Entity in accordance with these obligations, liabilities or responsibilities. However, if the insuring Party fails to effect and keep in force an insurance which is available and which it is required to effect and maintain under the Contract, and the other Party neither approves the omission nor effects insurance for the coverage relevant to this default, any moneys which should have been recoverable under this insurance shall be paid by the insuring Party.</p> <p>Payments by one Party to the other Party shall be subject to Sub-Clause 2.5 [Procuring Entity's Claims] or Sub-Clause 21.2 [Contractor's Claims], as applicable.</p>
<p>Insurance for Works and Contractor's Equipment</p>	<p>20.2</p>	<p>The insuring Party shall insure the Works, Plant, Materials and Contractor's Documents for not less than the full reinstatement Cost including the Costs of demolition, removal of debris and professional fees and profit. This insurance shall be effective from the date by which the evidence is to be submitted under Sub-Clause 20.1 [General Requirements for Insurances], until the date of issue of the Taking-Over Certificate for the Works.</p> <p>The insuring Party shall maintain this 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 caused by the Contractor in the course of any other operations including those under Clause 13 [Defect Liability].</p> <p>The insuring Party shall insure the Contractor's Equipment</p>

		<p>for not less than the full replacement value, including delivery to Site. For each item of Contractor's Equipment, the insurance shall be effective while it is being transported to the Site and until it is no longer required as Contractor's Equipment.</p> <p>Unless otherwise stated in the Special Conditions, insurances under this Sub-Clause:</p> <ul style="list-style-type: none"> i. shall be effected and maintained by the Contractor as insuring Party, ii. shall be in the joint names of the Parties, who shall be jointly entitled to receive payments from the insurers, payments being held or allocated to the Party actually bearing the Costs of rectifying the loss or damage, iii. shall be extended to cover liability for all loss and damage from any cause not listed in Sub-Clause 18.3 [Procuring Entity's Risks], iv. shall also cover, to the extent specifically required in the Contract Data, loss or damage to a part of the Works which is attributable to the use or occupation by the Procuring Entity of another part of the Works, and loss or damage from the risks listed in Sub-Clause 18.3 [Procuring Entity's Risks], excluding (in each case) risks which are not insurable at commercially reasonable terms, and v. may however exclude loss of, damage to, and reinstatement of: <ul style="list-style-type: none"> (a) a part of the Works which is in a defective condition due to a defect in its design, materials or workmanship (but cover shall include any other parts which are lost or damaged as a direct result of this defective condition and not as described in sub- paragraph (b) below), (b) a part of the Works which is lost or damaged in order to reinstate any other part of the Works if this other part is in a defective condition due to a defect in its design, material or workmanship, and (c) A part of the Works which has been taken over by the Procuring Entity, except to the extent that the Contractor is liable for the loss or damage.
<p>Insurance against Injury to Persons and Damage to Property</p>	<p>20.3</p>	<p>The insuring Party shall insure against each Party's liability for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under Sub-Clause 20.2 [Insurance for Works and Contractor's Equipment]) or to any person (except persons insured under Sub-Clause 20.4 [Insurance for Contractor's Personnel]), which may arise out of the Contractor's performance of the Contract and occurring before the issue of the Performance Certificate.</p> <p>This insurance shall be for a limit per occurrence of not less than the amount stated in the Contract Data with no limit on the number of occurrences.</p>

		<p>Unless otherwise stated in the Special Conditions, the insurances specified in this Sub-Clause:</p> <ul style="list-style-type: none"> i. shall be effected and maintained by the Contractor as insuring Party, ii. shall be in the joint names of the Parties, iii. shall be extended to cover liability for all loss and damage to the Procuring Entity's property (except things insured under Sub-Clause 20.2 [Insurance for Works and Contractor's Equipment] arising out of the Contractor's performance of the Contract, and iv. may however exclude liability to the extent that it arises from: <ul style="list-style-type: none"> (a) the Procuring Entity's right to have the Permanent Works executed on, over, under, in or through any land, and to occupy this land for the Permanent Works, (b) damage which is an unavoidable result of the Contractor's obligations to execute the Works and remedy any Defects, and (c) a cause listed in Sub-Clause 18.3 [Procuring Entity's Risks], except to the extent that cover is available at commercially reasonable terms.
Insurance for Contractor's Personnel	20.4	<p>The Contractor shall effect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel.</p> <p>The insurance shall cover the Procuring Entity and the Engineer-in-charge against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Procuring Entity or of the Procuring Entity's Personnel.</p> <p>The insurance shall be maintained in full force and effect during the whole time that these personnel are assisting in the execution of the Works. For a Subcontractor's employees, the insurance may be effected by the Subcontractor, but the Contractor shall be responsible for compliance with this Sub-Clause.</p>
21. Claims, disputes and Arbitration		
Recovery	21.1.1	<p>Any amount inadvertently paid as not due to the Contractor shall be treated as acknowledged recovery/ or debt due from the Contractor. The Contractor shall immediately inform the Engineer-in-charge about such amount and offer to reimburse immediately to the Engineer-in-charge.</p>

	21.1.2	<p>Whenever any claim against the Contractor for the payment of a sum of money arises out of or under the Contract, the Procuring Entity shall be entitled to recover such a sum by appropriating, in part or whole of the Performance Security, or enlistment deposit of the Contractor. In the event of the Performance Security and enlistment deposit being insufficient or if no Performance Security has been taken, then the balance or the total sum recoverable, as the case may be, shall be deducted from any sum, then due or which at any time, thereafter, may become due to the Contractor, under this Contract or other Contracts with the Procuring Entity. Should these sums not be sufficient to cover the full amount recoverable, the balance remaining due shall be recovered from the Contractor as arrears of land revenue under Section 53 of the Act.</p>
<p>Contractor's Claims</p>	21.2	<p>If the Contractor considers himself to be entitled to any extension of the Time for Completion and/ or any additional payment, under any Sub-Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall give notice to the Engineer-in-charge, describing the event or circumstance giving rise to the claim. The notice shall be given as soon as practicable, but not later than 28 Days after the Contractor became aware, or should have become aware, of the event or circumstance.</p> <p>If the Contractor fails to give notice of a claim within such period of 28 Days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Procuring Entity shall be discharged from all liability in connection with the claim. Otherwise, the following provisions of this Sub-Clause shall apply.</p> <p>The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.</p> <p>The Contractor shall keep such contemporary records as may be necessary to substantiate any claim included in the claim, either on the Site or at another location acceptable to the Engineer-in-charge. Without admitting the Procuring Entity's liability, the Engineer-in-charge may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/ or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Engineer-in-charge to inspect all these records, and shall (if instructed) submit copies to the Engineer-in-charge.</p> <p>Within 42 Days after the Contractor became aware (or should have become aware) of the event or circumstance giving rise to the claim, or within such other period as may be proposed by the Contractor and approved by the Engineer-in-charge, the Contractor shall send to the Engineer-in-charge a fully detailed claim which includes full supporting particulars of the basis of the claim and of the</p>

	<p>extension of time and/or additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:</p> <ul style="list-style-type: none">i. this fully detailed claim shall be considered as interim;ii. the Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/ or amount claimed, and such further particulars as the Engineer-in-charge may reasonably require; andiii. the Contractor shall send a final claim within 28 Days after the end of the effects resulting from the event or circumstance, or within such other period as may be proposed by the Contractor and approved by the Engineer-in-charge. <p>Within 42 Days after receiving a claim or any further particulars supporting a previous claim, or within such other period as may be proposed by the Engineer-in-charge and approved by the Contractor, the Engineer-in-charge shall respond with approval, or with disapproval and detailed comments. He may also request any necessary further particulars, but shall nevertheless give his response on the principles of the claim within the above defined time period.</p> <p>Within the above defined period of 42 Days, the Engineer-in-charge shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with Sub-Clause 8.6 [Extension of Time for Completion], and/ or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.</p> <p>Each Payment Certificate shall include such additional payment for any claim as have been reasonably substantiated as due under the relevant provision of the Contract. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim, the Contractor shall only be entitled to payment for such part of the claim as he has been able to substantiate.</p> <p>If the Engineer-in-charge does not respond within the timeframe defined in this Sub-Clause, the matter may be brought to the attention of the Procuring Entity by the Contractor within 15 days (beyond the initial period of 42 days) for timely intervention. If the Contractor is not satisfied with the decision of the Engineer-in-charge/ Procuring Entity, the Parties may refer the dispute to the Dispute Resolution Board in accordance with Sub-Clause 21.3 [Dispute Resolution].</p> <p>The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply to a claim. If the Contractor fails to comply with this or another Sub-Clause in relation to any claim, any extension of time and/ or additional payment shall take account of the extent (if any) to which the failure has prevented or prejudiced</p>
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		proper investigation of the claim, unless the claim is excluded under the second paragraph of this Sub-Clause.
Dispute Resolution	21.3.1	The procedure of reference of disputes to the Dispute Resolution Board and its functioning shall be as per Appendix B.
	21.3.2	The disputes which remain unresolved by the Dispute Resolution Board may be referred by either Party to Arbitration.

APPENDIX A

General Conditions for admissibility of Escalation

1. The exact percentage of labour/ material (excluding materials to be supplied by the Procuring Entity)/ bitumen/ diesel and petrol/ cement/ steel component for the Works shall be approved by the authority while sanctioning the detailed Estimates.

2. The breakup of components of labour/ materials (excluding materials to be supplied by the Procuring Entity)/ bitumen/ diesel and petrol/ cement/ steel as indicated in this Clause have been pre-determined as below:-

(a)	Labour -----	30 percent
(b)	Material -----	50 percent
(c)	Bitumen -----	01 percent
(d)	Diesel and Petrol -----	01 percent
(e)	Cement -----	12 percent
(f)	Steel -----	06 percent
	Total-----	100%

3. While allowing price escalation the following shall be deducted from the value of Works done (R):

(a) Cost of material supplied by the Procuring Entity.

(b) Cost of services rendered for protection of the Works.

(c) Secured Advance/ any advance added earlier but deducted now after Works is measured.

(d) Cost of extra items, the rates for which have been worked out based on market rates/ mutually agreed rates.

4. The first statement of escalation shall be prepared at the end of three months in which the Works was awarded and the Works done from the date of start to the end of this period shall be taken into account. For subsequent statement, cost of Works done during every quarter shall be taken into account. At the completion of Works, the Works done during the last quarter or fraction, thereof, shall be taken into account.

5. For the purpose of reckoning the Works done during any period, the bills prepared during the period shall be considered. The dates of recording measurements in the Measurement Book by the Assistant Engineer shall be the guiding factor to decide the bills relevant to any period. The date of completion, as finally recorded by the competent authority in the Measurement Book, shall be the criterion.

6. The index relevant to any quarter, for which such compensation is paid, shall be the arithmetical average of the indices relevant of the calendar month.

7. Price adjustment Clause shall be applicable only for the Works that is carried out within the stipulated time, or extension thereof, as are not attributable to the Contractor.

8. If during the progress in respect of Contract Works stipulated to cost Rs.50 lacs or less, the value of Works actually done excluding cost of material supplied by the Procuring Entity, exceeds Rs. 50 lacs and completion period is more than 3 months, then escalation would be payable only in respect of value of Works in excess over Rs.50 lacs from the date of satisfying both the conditions.
9. Where originally stipulated period is 3 months or less but actual period of execution exceeds beyond 3 months on account of reasons not attributable to the Contractor, escalation amount would be payable only in respect of extended period if amount of Works is more than Rs.50 lacs.
10. In case the Contractor does not make prorata progress in the first or another time span and the short fall in progress is covered up by him during subsequent time span within original stipulated period then the price escalation of such Works expected to be done in the previous time span shall be notionally given based upon the price index of that quarter in which such Works was required to be done.
11. No claims for price adjustment other than those provided herein, shall be entertained.
12. If the period of completion including extended period attributable to the Procuring Entity exceeds three months but cost does not exceeds more than Rs.50 lacs, no escalation is admissible.
13. Similarly, if cost of Works increases more than Rs.50 lacs but completion period including extended period attributable to the Procuring Entity is less than 3 months, no escalation is admissible.
14. No provisional escalation is payable on the basis of indices of the previous quarter in absence of non publication of indices for concerned quarter by the RBI.
15. Escalation is always payable quarterly and no provisional escalation is payable monthly or fortnightly.
16. In case at the time of executing agreement, both the conditions (completion period 3 months and amount of Works Rs.50 lacs for admissibility of price escalation are not fulfilled and subsequent due to additional Works and extension of time attributable to Procuring Entity, both the conditions become fulfilled, in that case the escalation shall be payable from the date of satisfying both the conditions and only for Works done beyond Rs.50 lacs and in period of Works beyond 3 months.
17. The Contractor shall for the purpose of these conditions keep such books of account and other documents as are necessary to show the amount of any increase claimed or reduction available and shall allow inspection of the same by a duly authorised representative of the Government/ Procuring Entity and further shall at the request of the Engineer-in-charge furnish, verified in such a manner as the Engineer-in-charge may require any documents so kept and such other information as the Engineer-in-charge may require.
18. Price variation Clause shall be applicable in case of lump sum contracts estimated to cost more than Rs.100 crores with stipulated completion period of more than 18 months.
19. The component of operation and maintenance (O&M) cost included in the Contract Price shall not be subject to price variations. The price may be adjusted by the use of prescribed formula (or formulae) which breaks down the total price into components.
20. The amount of price variation in case of lump sum contracts will be made by adding or deducting, as the case may be, from the payments made at the stages of Works specified in the Contract document.

Appendix B

Dispute Resolution During Execution of the Contract

1.0 Dispute

Disputes are germane to any contract. A 'dispute' implies an assertion of a right or a claim by one party and repudiation thereof by the other party, either expressed or implied, and may be by words or by conduct. A mere 'difference' is not necessarily a dispute; when the parties fail to resolve it, the difference culminates in dispute.

1.1 Dispute Resolution in a Construction Contract

Since arbitrations are fairly time consuming, it is always advisable to sort out the disputes mutually through the mechanism of adjudication through Dispute Resolution Board (DRB), which is a sort of voluntary arbitration. Arbitration can be resorted to if the adjudication decision is not forthcoming or is not acceptable to any party. For dispute resolution following procedure will be followed:

2.0 Dispute Resolution Board (DRB)

- (a) A formal Sub-Clause of obtaining dispute resolution through DRB will be inserted in the Conditions of the Contract. A separate Dispute Resolution Agreement will also be drawn up, detailing therein provisions like: Eligibility of Members, date of commencement, manner of entry on the reference by the Members and their resignation; obligation of the Members, the Procuring Entity and the Contractor; terms of payment (monthly retainerhip fee, daily fee for travel & site visits, out-of-pocket expenses); manner of sharing the fees and expenses and of making payments; arrangements of site visits and their frequency; conduct of hearings; termination/ phasing out the activities of DRB; default of the Member, and action to be taken in case of dispute in relation to DRB Agreement, etc.
- (b) DRB should be put in place within one month of Letter of Acceptance.
- (c) The DRB for all projects costing more than Rs 10 crore will comprise of three Members, one each to be appointed by the Procuring Entity and the Contractor and approved by the other. The third Member, who will also act as the presiding Member, will be selected by the first two Members and approved by the parties. If either of the first two Members is not so selected and approved, or the parties fail to reach an agreement on the third Member then on request of either or both parties, appointment will be made by concerned Administrative Department in case of Government Departments and Head of the Organisation (Chairman, etc.) concerned in other cases.
- (d) The Members to be appointed shall be out of a panel maintained by the Department/ Organisation concerned and should be experienced in the type of construction actually involved and/ or finance and accounts and/ or contractual documents. **They should be persons of repute and integrity.**
- (e) If any dispute that arises at any stage between the Procuring Entity and the Contractor in connection with, or arising out of the Contract or the execution of the Works, including any disagreement by either party with any action, inaction, opinion, instruction, determination, certificate or valuation of the Engineer, the matter in dispute shall, in the first place, should be tried to be settled amicably. If the dispute still remains unsettled, it shall be referred to the DRB.

- (f) Both parties shall promptly make available all information, access to the Site, and appropriate facilities, as the DRB may require for the purposes of making a recommendation on such dispute.
- (g) Within 56 days after receiving such reference, or within such other period as may be proposed by the DRB and approved by both parties, the DRB shall give its recommendation with reasons. The recommendation shall be binding on both parties, who shall promptly give effect to it unless and until it shall be revised in an amicable settlement or an arbitral award as described below. Unless the Contract has already been abandoned, repudiated or terminated, the Contractor shall continue to proceed with the Works in accordance with the Contract.
- (h) If either party is dissatisfied with the recommendation, then either party may, within 28 days after receiving the recommendation, or if the DRB fails to give its recommendation within 56 days (or as otherwise approved), within 28 days after the said period of 56 days has expired, give notice to the other party, with a copy to the Engineer-in-Charge, of its intention to commence arbitration proceedings.
- (i) If the DRB has given its decision within the stipulated period, and no notice of intention to commence arbitration as to such dispute has been given by either party within 28 days of the said decision, then the decision of DRB shall become final and binding.

3.0 Arbitration

- (a) Any dispute in respect of which the recommendations (if any) of DRB has not become final and binding, shall be finally settled by arbitration in accordance with the Indian' Arbitration and Conciliation Act, 1996, or any statutory amendment thereof.
- (b) The Arbitral Tribunal will comprise three Members, one each to be appointed by the Procuring Entity and the Contractor. The third Member, who will also act as the presiding Member, will be appointed by mutual consent of the first two Members. If the parties fail to reach an agreement on the third Member then on request of either or both parties, appointment will be made by concerned Administrative Department in case of Government Departments and Head of the Organisation (Chairman, etc.) concerned in other cases.
- (c) The Tribunal shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Engineer-in-Charge, and any decision of the DRB, relevant to the dispute.
- (d) Neither party shall be limited in the proceedings before the Tribunal to the evidence or arguments previously put before the DRB to obtain its decision, or to the reasons for dissatisfaction given in its notice of dissatisfaction.
- (e) Arbitration may be commenced prior to or after completion of the Works. The obligations of the Parties, the Engineer-in-Charge and the DRB shall not be altered by reason of any arbitration being conducted during the progress of the Works.

4.0 Language

All proceedings before DRB/ arbitral tribunal shall be in the Language of the Contract/ English.

5.0 Terms and conditions for engagement of DRB Member and Chairman

The terms and conditions including the remuneration and other facilities to be given to the Members of DRB and Arbitrators in case of civil engineering construction contracts/ consultancies shall be as

notified by the State Government from time to time. Each Party to the Contract (the Contractor/ Consultant) shall be responsible for paying one-half of the remuneration. Since the fee structure has to be agreed by both the parties i.e. Procuring Entity and Contractor/ Consultant, the fee structure may also be got accepted by the respective Contractor/ Consultants. In the contracts the fee structure may be included as part of the bidding documents/ contract documents and the acceptance of the fee structure by the Contractors/ Consultants may be kept as a pre-condition for signing the Contract.

Section VI B: Contract Data / Special Conditions of Contract

Ref. to GCC	Subject	Data
1.1	Procuring Entity's designation and address are:	<p>Designation: THE CEO</p> <p>Address: KOTA SMART CITY LIMITED Kota Rajeev Gandhi Bhawan Dushera Ground Kota. EMAIL: nnkota@gmail.com</p>
	The Name of Work is:	Development of DussehraMaiden(Phase-I) Kota with Civil, Electrical, Plumbing, Architectural and Landscaping work including 1 year defect liability and there after 03 years O&M
	The Site is:	Kota
	Engineer-in-Charge's Designation and Address and communication details are:	Engineer designated by The Procuring Entity
	Defect Liability Period (DLP)/ Defect Notification Period (DNP) is	The DLP/DNP is 365 Days after the date of issue of Completion Certificate.
	The Time for Completion and the Intended Completion Date are:	12 months with a grace period of one month (i. e. the period of Dussehrafair)
	Provisional sums/ Lump sums are:	As specified in Clause 1.1.3 of Section-II: Bidding Data.

	The Department is:	MUNICIPAL CORPORATION, KOTA
1.1.2.7	Parties and Persons	The Procuring Entities personnel shall include but not limited to any consultant appointed by the procuring entity, the Department and/ or the Representative.
1.3	Communication:	Electronic transmission shall include e-mail; fax etc. and delivered shall include their transmission sent successfully to correct address.
1.4	The Language of the Contract is:	English
1.8.1	Signing of the Contract Agreement:	<p>Within 30 Days of issue of notification of the award. (facsimile provided as Form-3).</p> <p>Add following text in the last.</p> <p>In case of JV</p> <p>It is mandatory to register the JV under relevant Act after award of Letter of Intent but before signing of Contract Agreement within 30 days of issuance of Letter of intent. Failure to register the JV in stipulated period may lead to forfeiting of bid security.</p> <p>The equity sharing as declared at the time of bidding shall be maintained while registering the JV before Contract execution. The minimum equities of all partners shall be maintained throughout the contract.</p> <p>The Agreement shall be signed by both the firm individually and by the representatives of JV.</p>
1.8.2	Signed copy of Contract Document to be given to Contractor	<p>Add :</p> <p>The Contractor shall provide to Engineer in charge 3 photo copies of the signed Document provided to him by the Procuring Entity.</p>
1.14	Care and Supply of documents	<p>Add :</p> <p>The Contractor shall maintain standard Site Order Books at the Site at all times during the execution of the Works for the use of the Engineer-in-charge and the Contractor. All instructions issued by the Engineer-in-charge to the Contractor shall be recorded in duplicate in the Site Order Book and shall be signed by the issuer and counter signed by the Contractor. After compliance with the instruction the Contractor shall record the same in the Site Order Book duly signed and countersigned by the Engineer-in-charge. Acceptance of any part of the Works executed by the Contractor shall be subject to verification with respect to compliance of respective instructions of the Engineer-in-charge through the Site Order Book. The Engineer-in-charge shall retain the original copy of the site orders, while the Contractor shall retain the duplicate ones.</p>

3.2A	Role of Consultant Appointed by Procuring Entity's	This work is already been taken up under "SMART CITY Project and SPV has been constituted. As soon as SPV comes into existence, the work will be handed over to SPV (KOTA SMART CITY LIMITED) with all assets and liabilities and the whole project will be executed under the Administrative and Financial control of SPV.
4.1.5	Requirement of designing by the Contractor:	Prior to commencement of the Tests on Completion, the Contractor shall prepare, and submit to the Engineer-in-charge operation and maintenance manuals in accordance with the Procuring Entity's Requirements and in sufficient detail for the Procuring Entity 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 until such operation and maintenance manuals have been submitted to the Engineer-in-charge for the entire developed area (Phase-I).
4.3.1	Performance Security	<p>Replace GCC Clause 4.3.1 (i to vi) with the following:</p> <p>Performance Security amounting to total 10% of contract value (but excluding O&M cost and provisional sum) shall be submitted as follows:</p> <p>(iv) Contractor shall submit Performance Security @ 10% in advance at the time of signing of agreement in form of BG as per latest rules under RTPP act. The BG should be issued by any nationalized / schedule bank and shall remain valid up to 60 days beyond defect liability period. Bank Guarantee submitted against the performance guarantee, shall be unconditional and en-cashable/invokable at Kota when presented in specified Branch Office.</p> <p>(v) If there is no reason to retain the Performance Security, it shall be returned back to the contractor within 60 days after the satisfactory completion of the defect liability period, subject to submission of fresh Performance Security valid for the entire O&M period, of an amount equal to 5% of total contract value (but excluding O&M cost and provisional sum) or 50% of the total O&M cost, whichever is higher.</p>
4.3.5	Refund of Performance Security	<p>Add :</p> <p>(i) Security deposit deposited as per clause 4.3 (i) above, shall be refunded within 60 days after the satisfactory completion of the Defect Liability Period subject to submission of fresh PG (for O&M) as per clause 4.3.1 (iii) above.</p> <p>(ii) 10% of this SD deposited for O&M, as per 4.3.1 (ii), shall be refunded at completion of O&M in all respect.</p>
4.4	Commencement of the Works	The Works shall be commenced within a period of 7 Days from the date of signing of the Contract.
4.9.1	Third Party Quality Inspections as per ISO 17020 by a Departmental Authority or	Shall be conducted

	QCI approved/ accredited bodies:	
4.14	Avoidance of Interference with public conveniences	<p>Add</p> <p>In case any operation connected with the works necessitates diversion, obstruction or closure of any road, railway, waterway or any other right of way, the approval of the Engineer-in-charge or the Engineer's Representative and the respective competent authorities shall be obtained well in advance by the Contractor. In case the Contractor's operations obstruct access to adjacent properties, the Contractor shall be responsible to provide reasonable temporary access to the affected parties. In case the Contractor fails to provide adequate temporary facilities, this shall be deemed to be an uncorrected Defect under the terms of Clause 31 and the Procuring Entity shall have the right to engage a third party to correct the Defect and the cost of such correction will be deducted from the Contract Price.</p> <p>The contractor will also be responsible to ensure completion of his work with utmost effort in earliest possible period to ensure minimum inconvenience to the public at large. If in the opinion of the Engineer in Charge, the work has not been done in time and the passage way not restored satisfactorily in time, he may after giving a notice of seven days have the work done through any other agency. He will in these circumstances enter the work done as work done by the contractor in measurement book and pay for the same to the contractor and also recover the actual cost paid by him for the work plus 5% of the value of this work from the payments or any other money due to the contractor.</p>
4.18	Cost of water & electricity	<p>Add:</p> <p>Water:- The Water required for construction purpose shall be arranged by Contractor at his cost. Procuring Entity's will not be responsible for any supply of water during construction phase and no time extension will be granted on account of non-availability of water.</p> <p>If the quality of ground water is not as per standards or if contractor makes his own arrangement for construction and drinking purposes, he will ensure that the quality of water conforms to relevant BIS standards as applicable according to the use to which the water is being put to. The quality of water shall be got tested as per BIS by the Contractor at his own cost at a laboratory approved by Engineer-in-Charge</p> <p>During the O&M period, permanent water connection shall be obtained by the contractor. Deposit/fees, if any, required by the water supply agency shall be paid by the Contractor and reimbursed by Procuring Entity's. All other works/expenses etc. are in the Contractor's scope. All maintenance and running expenses shall be borne by the Contractor</p> <p>Water for Hydraulic Testing:- Water required for Hydraulic testing of civil structures and during the process of laying of pipelines shall be arranged by the contractor from his own resources.</p> <p>Water for Flushing of Pipelines:-Water for flushings will be arranged</p>

		<p>by the contractor.</p> <p>Electricity:- For Construction purposes, the Contractor shall arrange and provide at his own cost electric connection of suitable load from Electric Supply Agency and will also keep ready Generators of adequate capacity as stand by arrangement in case of electric failure during construction for running pump sets, vibrators, mixer, needle sets and electric set and other electrically operated construction equipment etc at his own cost. However, Procuring Entity's will issue required essential certificate in favour of the Contractor for obtaining a temporary electric connection from Electric Supply Agency. The cabling for electric connection shall be arranged by the Contractor himself at his own cost. The non-availability /sanction of electric connection shall be no excuse for delay in completion of work.</p> <p>During the one year DLP and 03 year O&M period, Procuring Entity's will pay directly the power component of the O&M cost as per the prevailing tariff notified by the electricity supply agency from which power is drawn.</p>
		<p>For operating the plant, permanent power connection shall be obtained by the Contractor as per the requirement from Electric Supply Agency. For permanent connection, all the statutory deposits/fees as required by the Electric Supply Agency shall be paid by Procuring Entity's directly. However, follow up and liasoning with statutory authorities and all other expenses are in the Contractor's scope. For approval of entire electrical installation including H.T. Side shall be obtained by the Contractor at his own cost from electrical inspector or any other concerned agency, and no cost will be reimbursed by Procuring Entity's on this account.</p> <p>The electrical connection shall be in the name of Procuring Entity's. The electric supply shall be provided at one point to the Contractor for usage of plant and allied works. Rate of power per unit will be worked out on the basis of demand charges, equipment charges, misuse charges, if any, and any other charges/penalty levied by electric supply authority.</p> <p>If needed, approval of entire electrical installation shall be obtained by the Contractor at his own cost from electrical inspector and no cost will be reimbursed by Procuring Entity's on this account.</p>
4.19	Issue of Procuring Entity' equipments and materials, if any:	None

6.3.1	Employment of Technical Staff and other Employees	<p>Add:</p> <p>The list of technical staff and personnel required during the execution period and during the O&M period is given in the Tender Document (Clause 22 of Section –VIB).</p> <p>In case the contractor does not engage the staff as specified in this section, the EIC shall deduct amount from the running bills as indicated below:</p> <table border="1"> <thead> <tr> <th>S.No</th> <th>Position required</th> <th>Salary to be deducted if not engaged by contractor</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Project Manager</td> <td>Rs. 1,50,000/- per month</td> </tr> <tr> <td>2.</td> <td>Structural Engineer</td> <td>Rs. 75,000/- per month</td> </tr> <tr> <td>3.</td> <td>Civil Engineer</td> <td>Rs. 60,000/- per month</td> </tr> <tr> <td>4.</td> <td>Quantity Surveyor cum Safety Engineer</td> <td>Rs. 50,000/- per month</td> </tr> <tr> <td>5.</td> <td>Site Engineer cum Quantity Surveyor</td> <td>Rs. 50,000/- per month</td> </tr> </tbody> </table>	S.No	Position required	Salary to be deducted if not engaged by contractor	1.	Project Manager	Rs. 1,50,000/- per month	2.	Structural Engineer	Rs. 75,000/- per month	3.	Civil Engineer	Rs. 60,000/- per month	4.	Quantity Surveyor cum Safety Engineer	Rs. 50,000/- per month	5.	Site Engineer cum Quantity Surveyor	Rs. 50,000/- per month
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6.7	The normal working hours at the Site and Days of rest shall be:	<p>Add</p> <p>9 AM to 5 PM or as per relevant Labour Laws.</p> <p>However, when work is stopped, it should be ensured by the contractor that all safety measures have been taken to avoid any untoward incident during non-working hours.</p>																		
7.3	Inspection	<p>Add:</p> <p>The Contractor shall place order for the material and the equipment only after approval of the Engineer-in-charge.</p> <p>The Contractor shall inform the Engineer-in-charge about the likely dates of manufacturing, testing and dispatching of the material. The Contractor shall notify the Engineer-in-charge for inspection and testing, at least twenty eight (28) days prior to packing and shipping and shall supply the manufacturer's test results and quality control certificates.</p> <p>The inspection and test categories shall be applied prior to delivery of the equipment, of various categories as indicated in the technical specifications for each type of equipment.</p> <p>Category A: The drawing has to be approved by the Engineer-in-charge. Before manufacture and testing. The material has to be inspected by the Engineer-in-charge or an inspecting agency after approval of Engineer-in-charge. At the manufacturer's premise before packing and dispatching. The inspection charges of the agency will be borne by the Procuring Entity but the contractor has to pay the inspection charges. The contractor will include in their next bill the inspection charges and the same will be reimbursed by the Procuring</p>																		

Entity from the provisional sum. The contractor shall provide the necessary equipment and facilities for tests and the cost thereof shall be borne by the Contractor.

Category B: The drawings of the equipment have to be submitted and to be approved by the Engineer-in-charge prior to manufacture. The material has to be tested by the manufacturer and the manufacturer's test certificates are to be submitted and approved by the Engineer-in-charge before dispatching of the equipment. Notwithstanding the above, the Engineer-in-charge, after examination of the test certificates, reserves the right to instruct the Contractor for retesting, if required, in the presence of the Contractor's representative.

Category C: The material may be manufactured as per relevant standards and deliver to the site.

For material / equipment under Category 'A' and 'B' the Engineer-in-charge will provide an\ authorization for packing and shipping after inspection.

INSPECTION CATEGORY (For Sewer and water pipe line):

S. No.	Item	Category of inspection
1	RCC pipes, DWC pipes, PVCu pipes , DI pipes, CI pipes , Pre-Cast RCC Manholes, vent shafts , Pump sets, valves, Screens and Gates	A
2	Rubber ring, Manhole cover, frame, ferro cement footsteps, Fittings, Precast ferro cement RCC covers.	B
3	Any other item	C

The testing and approval for dispatching shall not absolve the Contractor's obligations for satisfactory performance of the equipment/material.

INSTRUMENTATION WORKS

SNo	Items	Category of Inspection
1	CC TV	B

MECHANICAL WORKS

SNo	Items	Category of Inspection
1.	All item as per direction EIC	A, B, C

ELECTRICAL WORKS

SNo	Items	Category of Inspection
1	Transformer	A
2	Power Capacitors and APFC Panel	A
3	415 V Power Cum Motor Control Centre and Motor Control Center	B
4	Sub-distribution boards and Main distribution (Lighting & power)	B
5	Other motors	B
6	Power and control cables (HT & LT)	B
7	Drop off fuse	C
8	Lightning arrestor	C
	Porcelain insulator and insulator fittings	C
10	HT panel with VCB s	A
11	HT metering panel	A
12	HT termination Kits	C
13	Earthing System and Materials	C
14	Local push button stations	C
15	Light fittings	C
16	Cable tray, supporting structural	C
17	Battery charger and Battery	C
18.	L T Cable glands and termination accessories	C
19.	Lighting materials, 3-Pin plug sockets, poles, switches, junction boxes, ceiling fan & exhaust fans	C
20.	DG SET	A

8.5	Construction Programme	<p>Add:</p> <p>Contractor has to submit his own Construction Programme based on his assessment and capabilities of the project.</p>																		
8.6,	Extension of Time for Completion	<p>ADD</p> <p>Extension of time Rate of progress of work, Liquidity Damages for each town shall be considered separately based on reason of delays.</p>																		
8.9	<p>Compensation/ Damages for Delay (Liquidated Damage)</p> <p><i>(In case of Lump Sum Contract, the liquidated damages shall be linked to Stage wise completion of Works as stated in Activity Schedule and specified in SCC)</i></p>	<p>h. If the Contractor fails to maintain the required progress in terms of Sub-Clause-8.6 [Extension of Time for Completion] or to complete the Works and clear the Site on or before the original or extended date of completion, he shall, without prejudice to any other right or remedy available under the Law to the Government/ procuring Entity on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the Engineer-in-charge (whose decision in writing shall be final and binding) may decide on the amount of contracted value of the Works for every time span that the progress remains below that specified in Sub-Clause-8.6 [Extension of Time for Completion] or that the Works remains incomplete. This will also apply to items or group of items for which a separate period of completion has been specified.</p> <p>i. To ensure good progress during the execution of Works, the Contractor shall be bound, in all cases in which the time allowed for any Works exceeds one month (save for special jobs or where time spans have been fixed in light of the specific construction programme), to complete 1/8th of the whole of the work before 1/4th of the whole time allowed under the contract has elapsed, 3/8th of the work before 1/2 of such time has elapsed and 3/4th of the work before 3/4 of such time has elapsed. If the Contractor fails to complete the work in accordance with this time schedule in terms of cost in money, and the delay of execution of Works is attributable to the Contractor, the Contractor shall be liable to pay compensation to the Government/ Procuring Entity at every time span as below:-</p> <table border="1"> <tr> <td>A</td> <td>Time Span of full stipulated period</td> <td>1/4th</td> <td>1/2th</td> <td>3/4th</td> <td>Full</td> </tr> <tr> <td>B</td> <td>Work to be completed in terms of money</td> <td>1/8th (Rs)</td> <td>3/8th (Rs)</td> <td>3/4th (Rs)</td> <td>Full (Rs)</td> </tr> <tr> <td>C</td> <td>Compensation payable by the Contractor for delay attributable to Contractor at the stage of</td> <td colspan="4"> <p>Delay up to one fourth period of the prescribed time span – 2.5% of the work remained unexecuted.</p> <p>Delay exceeding one fourth of the prescribed time span but not exceeding half of the prescribed time span - 5% of the work remained unexecuted.</p> <p>Delay exceeding half of the prescribed time span but not exceeding three fourth of the</p> </td> </tr> </table>	A	Time Span of full stipulated period	1/4 th	1/2 th	3/4 th	Full	B	Work to be completed in terms of money	1/8 th (Rs)	3/8 th (Rs)	3/4 th (Rs)	Full (Rs)	C	Compensation payable by the Contractor for delay attributable to Contractor at the stage of	<p>Delay up to one fourth period of the prescribed time span – 2.5% of the work remained unexecuted.</p> <p>Delay exceeding one fourth of the prescribed time span but not exceeding half of the prescribed time span - 5% of the work remained unexecuted.</p> <p>Delay exceeding half of the prescribed time span but not exceeding three fourth of the</p>			
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		<p>prescribed time span - 7.5% of the work remain unexecuted.</p> <p>Delay exceeding three fourth of the prescribed time span – 10% of the work unexecuted.</p>
<p>Note-1: In case delayed period over a particular time span is split up and is jointly attributable to the Procuring Entity and the Contractor, the competent authority may reduce the compensation in proportion of delay attributable to the Procuring Entity over entire delayed period over that time span after clubbing up the split delays attributable to the Procuring Entity and this reduced compensation would be applicable over the entire delayed period without paying any escalation.</p> <p>Note-2: The compensation, levied as above, shall be recoverable from the Payment Certificate payable after the concerned time span. The total compensation for delays shall, however, not exceed 10 percent of the total value of the Works.</p> <ul style="list-style-type: none"> j. The Contractor shall further be bound to carry out the work in accordance with the date and quantity entered in the progress statement attached to the Bid. k. However, if a time schedule has been submitted by the Contractor before execution of the agreement, and it is entered in agreement as submitted or as modified by the Procuring Entity or the Engineer-in-Charge, the Contractor shall complete the Works within the said time schedule. In the event of the Contractor failing to comply with the time schedule, he shall be liable to pay compensation as prescribed in foregoing paragraph of this Sub-Clause. While granting extension in time attributable to the Procuring Entity, reasons shall be recorded for each delay. l. The amount of compensation may be adjusted or set off against any sum payable to the Contractor under this or any Contract with the Procuring Entity. In case, the Contractor does not achieve a particular milestone mentioned in Contract Data or the rescheduled milestone(s), the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied at the final grant of extension of time. m. Withholding of this amount on failure to achieve a milestone shall be automatic without any notice to the Contractor. However, if the Contractor catches up with the progress of work on the subsequent milestone(s), the withheld amount shall be released. In case the Contractor fails to make up for the delay in subsequent milestone(s), amount mentioned against each milestone missed subsequent also shall be withheld. However, no interest, whatsoever, shall be payable on such withheld amount. <p>If the Contract is completed in the original time period as agreed upon in the Contract, then the Liquidated Damages so imposed for delays of intermediate milestones will be adjusted/ paid. Also, price escalation shall not be applicable if Liquidated Damages have been imposed. However, if the Contractor finishes the work as per the original time period, he shall be eligible to receive the price escalation.</p>		

8.10.1	Suspension of Work	ADD Suspension of work and other related clauses shall be considered separately.
8.11	Consequences of Suspension	ADD Suspension of work and other related clauses shall be considered separately.
8.12	Payment for Plant and Materials in Event of Suspension	ADD Suspension of work and other related clauses shall be considered separately.
8.13	Prolonged Suspension	ADD Suspension of work and other related clauses shall be considered separately.
8.14	Resumption of Work	ADD Suspension of work and other related clauses shall be considered separately.
9.0	Deviations Variations & Adjustments	ADD All Deviations, Variations and Adjustments shall be dealt individually.
9.2.1	Deviations/ Variations Extent and Pricing	Competent authority is as per prevailing SOP and Rules of department/ state government for similar nature of works. All deviations, variations and adjustments shall be dealt.
9.2.2	(In case of Lump Sum Contract, Rates of measured up additions and alterations shall be as per applicable BSR or rates of Day Work given be the Contractor and forming part of the Contract)	The concerned Schedule of Rates of the district/ area shall be the RUIDP SOR 2013. ADD Over All Deviation will be applicable after approval of Competent authority .
10.3	General Conditions	The following is stipulated in the Appendix A, point 18 of GCC; “Price variation Clause shall be applicable in case of lump sum

	for admissibility of Price Variation	contracts estimated to cost more than Rs.100 crores with stipulated completion period of more than 24 months”. In view of this, payment against price variation shall not be admissible for the work under this contract.
15.3	Schedule of Payments on performance based for sewer system and STP,s <i>(in case of Lump Sum Contract payments shall be linked to various stages of completion of Works given in the Activity Schedule)</i>	<p>Add:</p> <p>The modality of payment shall be as follows:</p> <p>(A) For Sewerage/water collection system</p> <ol style="list-style-type: none"> i. 40% of the cost of sewer/water line on supply and stacking at site ii. 30% of the cost of sewer/water line laying, jointing, hydro testing and road restoration iii. 30% on commissioning of system <p>(B) For Mechanical/ Electrical, Instrumentation and other items</p> <ol style="list-style-type: none"> i. 60% of the quoted price, against supply and storage at Site; ii. 20% after installation of the equipment; iii. 10% after testing and trial run completed successfully; and iv. 10% on commissioning of the equipment. <p>(C) For Septic tanks</p> <ol style="list-style-type: none"> i. 70% on design and construction at site ii. 30% on, hydro testing and commissioning <p>Payment on supply shall be considered as material advance and shall be payable only against unconditional BG.</p> <p style="text-align: center;"><u>Payments for Associated works</u></p> <p>1 Payment for Material: With respect to materials and Plant brought by the Contractor to the site for incorporation in the permanent works, No claim shall be made by the Contractor unless the following conditions have been met to the Engineers satisfaction.</p> <ol style="list-style-type: none"> i. The materials and plant are in accordance with the relevant BIS specifications for the works. ii. The materials and the plant have been delivered to the site and are properly stored and protected against loss, damage or deterioration. iii. The Contractors records of the requirements, orders, receipts and use of materials and plant are kept in a form approved by the Engineer, and such records are available for inspection by the Engineer. iv. The Contractor has submitted a statement of his cost of acquiring and delivering the materials and plant to the site, together with such documents as may be required for the purpose of evidencing

		<p>such cost.</p> <p>v. The materials are to be used within a reasonable time as decided by the Engineer and the Contractor shall not unnecessarily procure any material or equipment too much in advance.</p>
15.5	Minimum amount of an Interim payment Certificate shall be:	<p>Add :</p> <p>2% of the Accepted Contract Amount</p> <p>The certified running payment shall be made within 7 days to expedite the progress of work.</p>
15.15	Advance Payment for mobilization for execution of the Works:	DELETED
15.15	Percentage deductions for repayment of Advance Payment	DELETED
20	Insurance	<p>The details of Insurance covers to be obtained by the Contractor and the Procuring Entity, including their value, terms and extent of coverage and other terms and conditions shall be as under:</p> <p>The minimum amount of Third Party Liability insurance cover shall be Rs 20,00,000 (Rupees Twenty Lakhs only) per occurrence or event, with the number of occurrences not less than four. The Contractor shall promptly notify the Project Manager of each claim made under the Third Party Liability coverage, and shall renew the Third Party Insurance after each such occurrence in order to maintain the number of covered occurrences at not less than four.</p> <p>The minimum coverage against damage to the Works and materials during construction shall be Rs. 25,00,000 (Rupees Twenty Five Lakhs only).</p> <p>The entire cost of insurance as stipulated in clause 20 of GCC shall be borne by the contractor. The Insurance covers shall be handed over by one Party to the other Party at the time of signing of the Contract Agreement. Insurance covers should be renewed by the contractor before its expiry.</p>
22	Personnel (For each Town)	List of minimum personnel required during execution period

S. No	Position required	Educational Qualifications	Experience on similar work years/ Nos.	Mandated by the Single bidder	Mandated by bidders in JV (Not permitted)	Total Personnel by JV partners-
1.	Project Manager	Graduate/ post graduate in Environmental Engineering	15 years on various engineering works.	One		
2.	Structural Engineer	post graduate in Structural Engineering	5 years	One		
2.	Civil Engineer	Graduate/ post graduate in Engineering	5 years	One		
4.	Quantity Surveyor cum Safety Engineer	Diploma in Engg.+ safety at construction site course.	-do-	One		
5.	Site Engineer cum Quantity Surveyor	Diploma in Engg	3 years	four		
6	<i>water supply and sanitary Engineer</i>	On requirement call				

For Guidance:

Suggestive Duties:

1. Project Manager: Overall project coordination and monitoring to ensure completion in time and given cost. He will be Contractor's authorised representative at the Site. He will be a Civil/Mechanical or Electrical /Electronics Engineer.

2. Structural Engineer: to be a project specialist on designs, i.e. structural engineer for buildings/bridges, etc.

3. Civil Engineer: to be a Civil Engineer and experience of various project of Building, Road, water supply and sewerage projects, etc.

3. Materials/ Quality Investigation Engineer: Civil Engineer good at materials and all kinds of subsoil/geo tech investigations. Sampling, testing, compliance to Quality Assurance Plan, surveys, investigations,

Compliance to specifications, drawings and designs.

4. Quantity Surveyor cum safety Engineer: Estimating, billing, variations, safety at site operations, etc.

List of minimum personnel to be engaged during O&M

category of employee	Number of employees quantity
Project manager	1
Technical Supervisor	1
Sweeper	10
Pump Driver/technician	1
Electrician	1
Fitter	1
Sec. Guard	10
Gardener	02
Labour	As per Requirement

Machinery & Equipment:

(a) Suggestive list of equipment required in the field laboratory at each town

S. No.	Equipment	Min. Nos. Required.
	For Building Construction Projects	
1.	IS sieves with lid/pan: Size in mm: 100, 90, 80, 63, 53, 45, 37.5, 26.5, 19, 13.2, 11.2, 9.5, 4.75, 2.8, 5.6, 3.35, 2.36, 600, 500, 425, 355, 250, 212, 180, 150, 90, 75, 63, 53, 45, and 38 micron,	1 set
2.	Cube moulds 70 mm for mortar	6
3.	Cube moulds for CC 150 mm	6
4.	Compression testing machine 200t	1
5.	Electronic/digital balance 1 kg with least count of 0.01g	1
6.	Electronic / digital balance 5 kg	1
7.	Pan balance with weight box 5 kg.	1
8.	Enameled tray	6
9.	Oven (300oC) thermostatically controlled, sensitivity 1° C	1
10.	Slump cone	1

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**Machinery & Equipment
(For Each Town)**

11.	First Aid Box	1
12.	Vicat Apparatus	1
13.	Room cooling equipment for temperature control	1 or 2
14.	Atterberg Limit Apparatus	1
15.	Steel tapes 50 m	2
16.	Steel tapes 5m	6
17.	All relevant BIS codes,	1 copy each for ref.
18.	Computer, printer , modem and internet	1 set.
19.	Others if required:	

(b) Suggestive list of Machinery & Equipment required (not more than 5 years old): For works costing more than Rs 10 crore

S No	Equipment	Building works	BT Road works	CC Road works	Drainage works	Water supply/ Sewerage works	Bridges	Canal	Dams	Power transmission	Power generation	Industrial works	Air ports	Tunnels
General Equipment														
1.	JCB, adequate No and suitable capacity	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2.	Tippers, 12-40 T	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3.	Tractors with or without tankers/ trolleys.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Buildings and CC Roads equipment														
4	CC batch	Y	Y	Y	Y	x	Y	x	X	x	Y	Y	Y	Y

			Mix plant 30cum/hr							(exce pt in CC dams)		(15 cphl s adeq uate)		
5.	Mechanic al Mortar mixers	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
6.	Steel centering shutterin g and interlocki ng scaffoldin g	Y	x	x	x	x	Y	x	Y	Y	Y	Y	x	Y
7.	Transit mixers for CC	x	x	Y	Y	x	Y	Y	Y	Y	Y	Y	Y	Y
8	CC pavers	x	Y	Y	x	x	X	Y	Y	x	x	x	Y	Y
9	Continuo us Kerb casting machines	x	Y	Y	x	x	Y	Y	x	x	x	x	Y	Y
10	CC Joint cutters	x	x	Y	x	x	X	x	x	x	x	x	Y	Y
11.	CC joint sealant pourers	x	x	Y	x	x	X	x	x	x	x	x	Y	Y
12.	CC floaters and finishers	x	x	Y	x	x	X	x	x	x	x	x	Y	Y
13	Side channel s for CC /WMM paving	x	Y	Y	x	x	X	x	x	x	x	x	Y	Y
14.	Vibrator y screens	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bituminous Roads Equipment														
15.	WMM batching plant	x	Y	Y	x	x	Y	x	Y	x	x	Y	Y	Y
16.	BT Hot mix	x	Y	x	x	x	Y	x	x	x	x	x	Y	Y

			batching plant 120TPH														
		17.	BT paver 7m wide	x	Y	x	x	x	X	x	x	x	x	x	x	Y	x
		18.	Pre-stressing gear/equipment	x	x	x	x	x	Y	x	x	x	x	x	x	x	x
		19.	Mechanical Jacks up to 60 T	x	x	x	x	x	Y	x	x	x	x	x	x	x	x
		20.	Mechanical compressors 200 cfm	x	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
		21.	Steel H frames	Y	x	x	x	x	Y	x	x	x	x	x	Y	Y	
		22.	Construction site safety equipment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
		23.	Welding equipment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
		24.	Erection equipment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
		25.	Tools and tackles	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
		26.	First aid kit and equipment /doctor on call	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
		27.	Firefighting equipment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
		28.	Insert Earthen dam construction														

			equipme nt																
		29.	-do- canals																
		30.	-do- sewerage/ drainage																
		31.	-do- Industrial Buildings																
		32.	-do Thermal Power plants																
		33.	-do- hydropow er station																
		34.	-do- water supply projects.																
		35.	-do- Airport Projects.																

(c) Suggestive list of survey equipment required

S. No	Survey Equipment	Minimum No. required.
1.	DGPS (Digital Global Positioning System)	1
2.	Total Station	1
3.	Precision level	5
4.	Measuring Equipment	As required.
5.	Others as required	

24	Service Improvement Plan (SIP)	<p>SIP- Activity Schedule</p> <p>Schedule of various activities of the SIP is shown in Table as below:</p> <p style="text-align: center;"><u>SIP Activity Schedule</u></p>
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		S N	Activity	Target period for completion from contract commencement date	Amount of penalty to be recovered in case of delayed output
		1	Mobilisation including mobilization of office, mobilization of survey team and engineering staff as per contract.	7 days	
		2	Confirmatory of Topographical survey of the service area including TBMs.	15 days	Rs. 25,000 per day
		3	In case of discrepancy, of drawing variations (abstract of final quantities and cost estimates), etc for the SIP	30 days	Rs. 125,000 per day
		4	Preparing PERT chart, manpower, equipment, mobilization plan, cash flow plan, detailed methodology of continuous monitoring etc.	35 days	Rs. 125,000 per day
		5	Compilation and submission of SIP in complete	40 days	Rs. 150,000 per day
		6	Approval of final SIP	45 days	
25		All items shall be BIS/ISI Marked for which BIS is available.			
26		<u>Event of commissioning of Project:</u> The defect liability period shall commence after successful completion .			

Section VI C: Contract Forms

Table of Contents

1. Letter of Intent.....	.....
2. Letter of Acceptance.....	.....
3. Contract Agreement.....	.....
4. Performance Security .....	.....
5. Performance Security Declaration .....	.....

1. Letter of Intent

Letter of Intent

[on letterhead paper of the Representative]

No.

Dated

To: *[name and address of the Contractor]*

Subject: *[Notification of Award for the Works]*

This is to notify you that your Bid dated **[date]** for execution of the
 . **[name of the contract and identification number, as given in the Contract Data]** . .
 for the Accepted Contract Amount of the equivalent of **[.amount in
 numbers and words and name of currency]**, as corrected and modified in
 negotiations and in accordance with the Instructions to Bidders has been accepted by
 CEO Municipal Corporation, Kota..... The date of commencement and
 completion of the Works shall be:

You are requested to furnish the Performance Security/ Performance Security
 Declaration within Days in the form given in the Contract Forms for the same
 for an amount equivalent to Rupees within days of notification of the
 award valid up to 60 days after the date of expiry of Defects Liability Period and
 maintenance period, if applicable, and sign the Contract, failing which action as stated in
 sub-section 2 of section 42 of the Rajasthan Transparency in Public Procurement Act,
 2012 and Instructions to Bidders shall be taken.

Authorized Signature:

Name and Title of Signatory: CEO Municipal Corporation, Kota.

Designation:

2. Letter of Acceptance

Letter of Acceptance

[on letter head paper of the Municipal Corporation, Kota]

No.

Dated

To: **[name and address of the Contractor]**

Subject: **[Notification of Award for the Works]**

This is to notify you that your Bid dated **[date]** for execution of the
 . **[name of the contract and identification number, as given in the Contract Data]** . .
 for the Accepted Contract Amount of the equivalent of **[.amount in
 numbers and words and name of currency]** , as corrected
 and modified in negotiations and in accordance with the Instructions to Bidders has been
 accepted by Municipal Corporation, Kota The date of commencement and completion
 of the Works shall be:

You are requested to furnish the Performance Security/ Performance Security
 Declaration within Days in the form given in the Contract Forms for the same
 for an amount equivalent to Rupees within days of notification of the
 award valid up to 60 days after the date of expiry of Defects Liability Period and
 maintenance period, if applicable, and sign the Contract, failing which action as stated in
 sub-section 2 of section 42 of the Rajasthan Transparency in Public Procurement Act,
 2012 and Instructions to Bidders shall be taken.

Authorized Signature:

Name and Title of Signatory: CEO Municipal Corporation, Kota

Designation:

3. Contract Agreement

Contract Agreement

THIS AGREEMENT made theday of,, between the Governor of Rajasthan/ [Nagar Nigam, Kota]. (hereinafter “the Procuring Entity”) which expression shall, where the context so admits, be deemed to include his successors in office and assigns, of the one part, and [**name of the Contractor**] (hereinafter “the Contractor”), which expression shall, where the context so admits, be deemed to include his heirs, successors, executors and administrators, of the other part:

WHEREAS the *Procuring Entity* desires that the Works known as . Development of DussehraMaiden(Phase-I) Kota with Civil, Electrical, Plumbing, Architectural and Landscaping work including 1 year defect liability and there after 03 years O&M should be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects therein, and for which the Contractor has submitted Performance Security for Rupees ----- in the form of -----(For Nagar Nigam, Kota)

The Procuring Entity 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. This Agreement shall prevail over all other Contract documents.
 - a) the Letter of Acceptance;
 - b) the Bid of the Contractor as accepted alongwith the correspondence done on it, if any;
 - c) the Special Conditions of Contract/ Contract Data;
 - d) the General Conditions of Contract;
 - e) the Specifications;
 - f) the Drawings; and
 - g) the Instructions to Bidders and Notice Inviting Bids.
3. In consideration of the payments to be made by the Procuring Entity to the Contractor as indicated in this Agreement, the Contractor hereby covenants with the Procuring Entity to execute the Works and to remedy defects therein (and, if applicable, maintain the Works for a period of -----) in conformity in all respects with the provisions of the Contract.
4. The Procuring Entity hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein (and,if applicable, maintain the Works for a period of -----), 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.

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

Signed by

Signed by.....

for and on behalf of the Governor Entity

for and on behalf the Contractor

(CEO, Nagar Nigam, Kota

in the presence of

in the presence of

Witness, Name, Signature, Address, Date

Witness, Name, Signature, Address,
Date

4. Performance Security

Performance Security

..... *[Bank's Name, and Address of Issuing Branch or Office]*

Beneficiary: *CEO, KOTA SMART CITY LIMITED*

Date:

Performance Guarantee No.:.....

We have been informed that *[name of the Contractor]* (hereinafter called "the Contractor") has entered into Contract No. *[reference number of the Contract]*. dated with you, for the execution of *[name of contract and brief description of Works]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance security is required.

At the request of the Contractor, we *[name of the Bank]* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of Rupees* *[amount in figures]* (.Rupees..... *[amount in words]*) such sum being payable upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or to show grounds for your demand or the sum specified therein.

The Guarantor agrees to extend this guarantee for a specified period in response to the Procuring Entity's written request for such extension for that specified period, provided that such request is presented to the Guarantor before the expiry of the guarantee.

This guarantee shall expire, no later than the Day of , **, and any demand for payment under it must be received by us at this office on or before that date.

.....
Seal of Bank and Authorised Signature(s)

*** The Guarantor shall insert an amount representing the percentage of the Contract Price specified in the Contract**

**** Insert the date sixty days after the expected completion date, including defect liability period and maintenance period, if any.**

Notes: 1. All italicized text is for guidance on how to prepare this advance payment guarantee and shall be deleted from the final document.

2. The Procuring Entity should note that in the event of an extension of the time for completion of the Contract, the Procuring Entity would need to request

an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee.

5. Performance Security Declaration

Form of Performance Security Declaration

Date: _____ ***[insert date (as day, month and year)]***

Contract Name and No.: _____ ***[insert name and number of Contract]***

To: _____ ***[insert Designation and complete address of Procuring Entity]***

We, the undersigned, declare that:

We understand that, according to your conditions, the Contract must be supported by a Performance Security Declaration as a guarantee to ensure fulfillment of our all performance obligations under the Contract for _____ ***[insert name of subject matter of procurement]***.

We accept that we will automatically be suspended from being eligible for bidding in any contract with you for the period of time of _____ ***[Procuring Entity to indicate here the period of time for which the Procuring Entity will declare a Bidder ineligible to be awarded a Contract if the performance Security Declaration is to be executed]*** starting on the date that we receive a notification from you, the _____ ***[Designation of the Procuring Entity]*** that our Performance Security Declaration is executed, if we are in breach of any of our performance obligation under the conditions of the Contract,

We understand this Performance Security Declaration shall expire after 60 days of completion of our all obligations under the Contract including Defect Liability, warranty/ Guarantee, operation, maintenance, etc. in accordance with the conditions of the Contract.

Signed: _____

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

In the capacity of: _____

[insert legal capacity of person signing the Performance Security Declaration]

Name: _____

[insert complete name of person signing the Declaration]

Duly authorized to sign the Contract for and on behalf of: _____

[insert complete name and address of the Bidder]

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

Corporate Seal _____

SECTION VI B1

SPECIAL CONDITIONS OF CONTRACT –O&M

DEFINITIONS

1.5 Adverse Operating Period

The period, during no activity occur at Dusshera Ground.

1.6 Billing Period

Billing Period means each calendar month, except:

- (1) The first Billing Period shall begin on the Date commencement of contract as defined in clause 1.7 below and shall continue till the last day of the respective month;
- (2) The last Billing Period shall start on the first date of the month of expiry of contract and end on the date of expiry of contract as defined in clause 1.14 below.

Any computation made on the basis of a Billing Period shall be adjusted on a pro rata basis to take into account any Billing Period of less than the actual number of days in the month to which such Billing Period relates.

1.7 Commencement of O&M Period

From the date of Completion of the defect liability period as per Tender Document conditions. The defect liability period shall commence after completion of physical works and issue of Taking Over certificate

1.8 Operation and Maintenance Contract Period

Three years from the commencement of O&M period as per clause 1.7 above.

1.9 Date of Issue of Taking Over Certificate

After the completion of Period, for contract as per clause 1.8 above, provided that the contractor has fulfilled the provision of Tender Document.

1.10 Good Engineering Practice

In respect of the Contractor, its subcontractors, and all other such third party agents of the Contractor, practices, methods, techniques and standards, as changed from time to time, that are generally accepted for use internationally for use internationally for Maintenance of including but not limited to Roads, Street Lights, Electrical &-mechanical equipment(s), Water Tanks, Horticulture, all type of meters and control equipment(s), power sub-stations, and all other facility during construction, development, operations and maintenance, taking into account conditions in India.

1.11 Non-conformance Event

DELETED.

1.12 Operation and Maintenance Completion Certificate

As defined in Clause of Tender Document of this Project.

1.13 Operations and Maintenance Services

All Services which are the responsibility of the Contractor and are required to fulfil the obligation of bid document and/or in the approved operation and maintenance manual and as defined in any other clauses of this contract.

1.14 Expiry of Contract Period

As per Clause 1.8 above (or) as extended, as per the provisions of Tender Document.

Extension & Expiry of Contract

1.15 Extension of Operation and Maintenance Period

- 1.15.1** The Operations & Maintenance Period can be extended for another period of 7 years based on such terms as acceptable to both Parties (“The Contractor” and the “PROCURING ENTITY”)
- 1.15.2** In such an event, either Party (“The Contractor” or the “Department”) shall notify its intention to extend the Operations & Maintenance Period at least six months before its expiry and commence discussions with the other Party to arrive at a mutually agreed basis of terms and conditions for the extended period.

1.16 Expiry of the Operation and Maintenance Period & Taking Over By the Department

- 1.16.1** Six months prior to the expiry period, the Department will notify the contractor, the maintenance required for the facilities including all structures and road, plants, materials and equipment(s) therein, so that the facilities may be taken over in an acceptable physical conditions (physical conditions in reference to the initial physical condition at the start of O&M period, after accounting reasonable wear and tear during operation) and in operation conditions.
- 1.16.2** Notwithstanding to the notification done by department as per clause 1.16.1 above, the contractor shall repair, maintain and operate the facilities as per the terms and conditions of this contract, till 12.00 Noon up to the date of expiry of contract period.
- 1.16.3** The contractor, shall be liable for all defects, faults, blockages in sewer/chambers etc occurred or noticed prior to the 12.00 Noon, up to the date of expiry of contract, even if the facilities are taken over by the department subsequently, due to expiry of contract period, as per clause 1.16.2 above. However, the PROCURING ENTITY has to notify all such defects/liabilities of contractor within 30 days of taking over of facilities.
- 1.16.4** Till the date of expiry of contract period, the contractor shall do all routine and periodic/break-down maintenance as prescribed in the O&M manual, in force, at the time of expiry of contract.
- 1.16.5** On expiry of contract, the contractor shall hand over all spares, tools and for which he has been paid.
- 1.16.6** After, expiry of the contract, the contractor shall provide two copies of the updated O&M manual. The components of communication system used during O&M period in operating condition, the T&P required for maintenance of facilities.
- 1.16.7** If the contractor does not comply with any of the provisions from 1.16.1 through 2.2.6 above, or any other requirement in pursuance of Good Industrial Practices, the Engineer –In-charge shall estimate the cost of liabilities due to violation of any of the provisions of this contract. Such estimates made by Engineer-In-Charge shall be final and binding for the contractor. However, in a reasonable endeavor, such estimates shall be communicated to the contractor, within 30 days of expiry of the contract. The contractor shall be given an opportunity to rectify the damages through his staff/agents, or for supply of required material provided such rectification of defects on maintenance do not require any shut down of the system, within 60

days of such notification of estimates by department.

1.16.8 Within 120 days of expiry of the contract period as per clause 1.4, the Department shall prepare the final estimates for recovery from the contractor and shall prepare the final bill for the work.

1.16.9 If the recoveries to be done by Department are more than the final bill to be paid, the contractor shall deposit the required amount to be recovered from contractor or this amount shall be recovered from the securities/guarantees etc. with the department as deemed suitable.

1.16.10 After the date of expiry of contract and recoveries of all dues payable by the contractor, the Engineer-In-Charge shall issue a "Certificate of Taking over."

PAYMENTS

1.17 Basic Service CHARGE (BS)

The annual/yearly O & M charges for Developed Area shall be as specified in the BOQ and in tender document. Accordingly, monthly payments shall be made @ 1/12th of the stipulated fixed amount. O & M charges include all expenditures and expenses required to be incurred on labour, repair and/or replacement of material, equipment, consumable items, fuel, water and all other matters and things of what so ever nature essential and desirable to run the system satisfactorily (the O&M charges do not include power charges which shall be paid by the department/line agency). The year wise breakup of the payment is as under:

PROVISION FOR O & M OF CREATED UNDER THIS CONTRACT FOR THREE YEARS AS PER TENDER DOCUMENT				
Sl. No.	Description of work	No. or Qty.	Unit	FIXED RATE In DECIDED BY DEPARTMENT
1.00	Cost for Basic Service Charges, Administration and Management, Running of Office, Comprehensive Operation, Maintenance and Repairs including Preventive Maintenance, Consumables as per Scope of Work & terms & conditions of contract etc complete			
1.	For Year 1st of Operation and Maintenance of entire system during one year after defect liability period for entire Area created under this contract	1.00	YEAR	1928202
2.	For Year 2 of O&M of entire system during one year after defect liability period for entire Area created under this contract	1.00	YEAR	2121022
3.	For Year 3 of O&M of entire system during one year after defect liability period for entire Area created under this contract	1.00	YEAR	2313842
Total in Figures Rs. in Lacs				6363066.00

1.18 Reduction OF RATES (RR) for blockage in Sewer line

1.18.1 The contractor shall maintain the complaint register in his office and shall note all complaints received through telephone, SMS and email. In case any complaint of blockage, overflow, theft of manhole covers, minor repair unattended for a period more than 48 Hrs, penalty @ Rs. 2000.00 per day/complaint shall be imposed. In case any complaint of major repairs remains unattended for more than 7 days the penalty shall Rs. 5000.00 per day/complaint shall be imposed.

1.18.2 In case of any unit of Area during Dusshera period or other working time is non-functional for 2

hrs then Rs. 2000.0 per happening will be deducted from O&M bill. If non function period is more than 2 hrs and up to 4 hrs Rs. 5000.0 per happening will be deducted from O&M bill. If any unit of SPS is non functional more than 4 hrs then one day O&M cost plus Rs. 5000.0 as penalty will be deducted from O&M bill.

1.18.3 A token compensation of Rs. 1000.00 for unattended breakdown /overflow of any structures/over flow of MH and leakage in sewer line shall be imposed, if the delay in satisfactory completion of repair is beyond 12 hours from the time of each notice by the department.

1.18.4 In event of non-compliance of any of the effluent parameters stipulated in Tender during O&M period, a compensation of Rs 1000.00 per occurrence of non-compliance of any parameter stipulated in Tender will be deducted from monthly bill of the O&M.

1.19 Billing and Payment procedure

1.19.1 Commencing with the first Billing Period of the Operations & Maintenance period and for each Billing Period thereafter during the Operations & Maintenance Period,

1.19.2 The payment shall be in accordance with the following formula:

$$SF = BS - RR$$

Where:

SF = Service Fee

BS = Basic Service Charges, as per clause 1.17

RR = Reduction in Rates or any other deduction as per terms and conditions of contract

1.19.3 The Fee payable shall be computed in accordance with this Clause and shall be adjusted from time to time, due to the provisions of clause or any other provisions in the contract. The Service Fee is and shall be considered to be a Single Fee payable for O&M of the system. The Department shall pay the Contractor the Service Fee with respect to each Billing Period during the Operations & Maintenance Period, but shall have no obligation to pay the Service Fee till the commencement of O&M period as per TENDER DOCUMENT. The Service Fee constitutes the entire compensation of the Contractor for performing the Operation & Maintenance Services, as per the scope of work and other obligations due to this contract.

1.20 Taxes and Duties

1.20.1 The Contractor shall be responsible for paying all taxes/duties/cess including service tax, cess or any other levies imposed by the Government and assessed as due and payable by the Contractor associated with the carrying out of the services. Notwithstanding the provisions of any Clause of this Conditions of Contract for Operation and Maintenance, the Department shall be entitled to withhold or deduct from payment to the Contractor any amount demanded by the competent authority.

All statutory deductions shall be made from all the payments done to the contractor.

1.21 PROCURING ENTITY's rights

1.21.1 Inspection

The Department may periodically check the operation of the Facility or designate an organization of its choice at the cost of Department to carry out inspections of the Facility to satisfy itself that the Contractor is performing its obligations with due diligence.

The Contractor at its own cost shall provide any assistance required for such inspection of the Facility.

The Department representative can inspect the facility at any moment during the O&M period.

TERMINATION

1.22 Contractor's default

The PROCURING ENTITY /Department shall be entitled to terminate this Contract for the following reasons attributable to the Contractor, unless arising as a result of a Force Majeure Event, or any cause related to the obligations of the Department in clause 4.5.

- a) Repudiation of this Contract by the Contractor or the evidencing of an intention by the Contractor not to be bound by the terms of this Contract.
- b) Appointment of a provisional liquidator in providing for winding up of the Contractor unless such appointment has been set-aside within 45 days.
- c) The Contractor is ordered to be wound up by a court or files a petition for voluntary winding up except for the purpose of amalgamation or reconstruction provided that such amalgamation or reconstruction does not adversely affect the ability of the amalgamated or reconstructed entity to perform its obligations under this Contract, the successor has assumed in writing unconditional responsibility for the performance of the Contractor's obligations and the technical, financial and operating capability of the successor is satisfactory to the Department.
- d) The Contractor abandons the operation of the Facility.
- e) Under conditions expressly mentioned in any Clause of this Conditions of Contract for Operation and Maintenance.

1.23 Consequences of Termination by Department

If the Department, with reasonable grounds, terminates the contract under clause 6.1 above, the Secured Advances, and any other sums of the contractor with the Department, shall be fortified and action shall be taken against him as per clause 3 of General Conditions of Contract, if deemed appropriate.

INDEMNIFICATION

The Contractor to indemnify the Department against the following:

- (a) The Contractor shall at its own expense make good any physical loss or damage to the Facility occasioned by it in the course of the performance of its obligations under this Contract if and to the extent such loss or damage is caused by the willful misconduct or failure to follow Good Engineering Practices of the Contractor, any sub-contractor or their respective agents or employees.
- (b) The Contractor shall indemnify, defend and hold harmless the Department and its officers, employees, agents and affiliates against any and all claims of loss, damage and expense of whatever kind and nature, including all related costs and expenses incurred in connection therewith, in respect of personal injury to or death of third parties and in respect of loss of or damage to any third party to the extent that the same arises out of:
 - (i). Any breach by the Contractor of its obligations hereunder;
 - (ii). Any negligent act or omission on the part of the Contractor, its subcontractors or their respective agents or employees; and
 - (iii). Any willful misconduct or breach of statutory duty on the part of the Contractor, its subcontractors or their respective agents and employees.
 - (iv). Any other event where such indemnification has been expressly mentioned in this Conditions of Contract for Operation and Maintenance.
- (c) The Contractor shall indemnify, defend and hold harmless the Department and its, officers, employees, agents and affiliates against any and all claims of loss, damage and expense of whatever kind and nature, including all related costs and expenses incurred in connection therewith in respect of the death or injury to any person employed by the Contractor or its subcontractors in connection with the performance of the Contractor's obligations.

The Contractor shall indemnify the Department against all losses and claims in respect of:

- (a) Death of or injury to any person, or,
- (b) Loss of or damage to any property (other than the Works).

which may arise out of / in consequence of the Operation and Maintenance of the Facility and the remedying of any defects therein, and against all claims proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto, subject to the exceptions below

- (i). The permanent use or occupation of land by the Facility, or any part thereof.
- (ii). The right of the Department to execute the Facility, or any part thereof, on, over, under, in or through any land.
- (iii). Damage to property that is the unavoidable result of the execution and completion of the Works, or the remedying of any defects therein, in accordance with the contract.

INTELLECTUAL PROPERTY

All Intellectual Property conceived, originated, devised, developed or created by the Contractor specifically for the Facility or the carrying out of the obligations under this Contract shall vest in the Department as sole beneficial owner and shall be disclosed to the Department upon its [the Intellectual Properties] coming into existence.

Source code for computer programmers and associated documentation, storage media shall be made available to the Department by the Contractor free of cost

Any Intellectual Property of the Department that is required in connection with the performance of the obligations of the Contractor shall be made available to the Contractor free of charge for the purposes of this Contract alone

The Contractor shall, at its own cost and expense, ensure availability at all times during the Term of this Conditions of Contract for Operation and Maintenance, of any proprietary spares/consumables/equipment that it may have sourced for purposes of ensuring proper functioning of the Facility as per this Conditions of Contract for Operation and Maintenance.

The Contractor shall, as far as practicable, use its best efforts

- (a) To procure that Intellectual Property owned or developed by third parties and utilized by the Contractor in connection with the performance of its obligations under this Contract for the production of treated water from the Facility and otherwise for the Facility but for no other purpose on reasonable terms
- (b) To ensure that no Intellectual Property of a third party is otherwise used in the performance of the Contractor's obligations under this Contract without the approval from the Department.

On Termination of this Conditions of Contract for Operation and Maintenance, the Contractor shall transfer all such Intellectual Property whatsoever to the Department and/or to the Successor Operator at the discretion of the Department.

Price escalation for the O&M:

No price escalation shall be payable during the O&M period.