# SOUTHERN POWER DISTRIBUTION COMPANY OF T.G. LIMITED HYDERABAD

# CE, Operation, Ranga Reddy Zone,

# KPHB Colony, Hyderabad-72

# 

# BID DOCUMENT

**Name of the Work: Construction of Boundary wall with CRS Masonry and Barbed wire with RCC fencing pole for newly allotted land at Manchirevula for 33/11KV Sub Station in Cybercity Circle.**

**Specification No: CE/OP/RR Zone- 07/2025-26.**

**1**

Issued to Sri/Smt. M/s. ---------------------------------------------------------------

---------------------------------------------------------------

--------------------------------------------------------------

Phone: 040 – 23431434 Chief Engineer/Operation

Ranga Reddy Zone, TGSPDCL, KPHB Colony, Hyderabad.

CONTENTS

1. **INVITATION FOR BIDS (IFB)**
2. **SECTION –1 INSTRUCTIONS TO BIDDERS (ITB)**
3. **SECTION –2: FORM OF BID, QUALIFICATION INFORMATION**

**AND LETTER OF ACCEPTANCE**

1. **SECTION-3: GENERAL CONDITIONS OF CONTRACT**
2. **SECTION-4: CONTRACT DATA**
3. **SECTION-5: TECHNICAL SPECIFICATIONS**
4. **SECTION-6: BILL OF QUANTITIES**
5. **SECTION-7: FORMS OF SECURITIES**

# SOUTHERN POWER DISTRIBUTION COMPANY OF T.G LIMITED HYDERABAD

**Specification No.CE/OP/RR Zone- 07/2025-26**

|  |  |  |  |
| --- | --- | --- | --- |
| **1.** | **Name of the work** | : | Construction of Boundary wall with CRS Masonry and Barbed wire with RCC fencing pole for newly allotted land at Manchirevula for 33/11KV Sub Station in Cybercity Circle |
| **2.** | **Scheduled Amount of tender (ECV)** | : | **Total; Rs.16,34,825.13 (Excluding taxes)** |
| **3.** | **Period of completion of work** | : | 4 Months |
| **4.** | **Issue of Tender Schedule** | : | The bidders need to register on the electronic procurement market place of Government of T.S. that is [www.tender.telangana.gov.in](http://www.tender.telangana.gov.in). On registration on the e-procurement market place they will be provided with a user ID and password by the system using which they can submit their bids on line. |
| **5.** | **Bid Downloading Start Date** | : | **29.07.2025 from 15:00 hrs.** |
| **6.** | **Last Date for Submission of Bid (Uploading of Bid)** |  | **12.08.2025 upto17:00 hrs.** |
| **7.** | **Last date for submission of hard copies** |  | **13.08.2025 upto17:00 hrs.** |
| **8.** | **Technical Bid Opening Date** |  | **14.08.2025 at15:00 hrs.** |
| **9.** | **2.0% of Bid Security to be paid along with Tender** |  | **Rs.32,696.50/- in the form of Online/DD/BG** |
| **10** | **Transaction Fee Payable** | : | As specified by the TGTS department |

All tenderers shall hand over the original DD/BG for Bid Security which were uploaded to the Chief Engineer/Op/RR Zone/TGSPDCL, KPHB Colony, Hyderabad authorized representative directly or through his agent or by registered post or by courier service so as to reach on or before as per the due dates given above after opening of the tender otherwise the bidder will be disqualified.

|  |  |  |
| --- | --- | --- |
| **Notice Inviting Bid Details** | | |
| **Sl. no.** | **Description** |  |
| 1 | Department Name | TGSPDCL |
| 2 | Office | Chief Engineer Operation/ RRZone / TGSPDCL. |
| 3 | Bid Number | **Tender Specification No. CE/OP/RR Zone –07/2025-26** |
| 4 | Name of the Work | Construction of Boundary wall with CRS Masonry and Barbed wire with RCC fencing pole for newly allotted land at Manchirevula for 33/11KV Sub Station in Cybercity Circle |
| 5 | Work completion Schedule | 4 Months |
| 6 | Type of Bid | e-tender (Online) |
| 7 | Bid Category | Open tender |
| 8 | Bid Security (INR) | **Rs.32,696.50/- in the form of Online/DD/BG** |
| 9 | ECV amount | **Total; Rs.16,34,825.13 (Excluding taxes)** |
| 10 | Bid Security Payable | In the form of Online/DD, Demand Draft in favor of TGSPDCL payable at Hyderabad & BG in the prescribed format clearly addressed to CE/OP/RR Zone and duly mentioning the **Specification No of the bid., & name of the work** from any Scheduled or Nationalized Banks & the validity should not be less than **135** days from the date of bid Opening. |
| 11 | **Transaction** Fee | **Transaction Fee**: All the participating Bidders who submit, have to pay an amount @ 0.03% of their final Bid value online a cap of Rs.10,000/- for quoted value of work up to Rs.50 Cores Rs.25000/- if the purchase value is above Rs.50 crores & services applicable as levied by Govt. of India on transaction fee the online to the agency specified by TSTS department and the same amount is non refundable.  **Corpus Fund**: Successful Bidder has to pay an amount of Rs. 4,000/- through demand draft in favour of Managing Director TSTS, Hyderabad towards corpus fund at the time of **conclusion** of agreement. |
| 12 | **Transaction** Fee Payable to | As specified by TSTS department |
| 13 | Bid submission closing date time (for uploading) | **12.08.2025 upto 17:00 hrs.** |
| 14 | Submission of Hard copies | **13.08.2025 at17:00 hrs.** |
| 15 | Technical Bid opening date & time | **14.08.2025 at15:00 hrs.** |
| Price Bid opening date & time | **18.08.2025 at11:00 hrs.** |
| 16 | Place of Tender Opening | Chief Engineer/Operation/ RR Zone/TGSPDCL/KPHB Colony, Gr. Hyderabad – 500072 |
| 17 | Officer Inviting Bids/Contact Person | Chief Engineer/Operation/ RR Zone/TGSPDCL/KPHB Colony, Gr. Hyderabad – 500072 |
| 18 | Address | Chief Engineer/Operation/ RR Zone/TGSPDCL/KPHB Colony, Gr. Hyderabad – 500072 |
| E-mail Id | [**cgm-rrzone@tssouthernpower.com**](mailto:cgm-rrzone@tssouthernpower.com) |
| 19 | Contact Details/Telephone, Fax | Office Tele. Ph .No 23431434 |
| 20 | Procedure for Bid Submission | 1. Bids shall be submitted online on [**www.tender.telangana.gov.in**](http://www.tender.telangana.gov.in) platform. 2. The participating Bidders in the Bid should register themselves free of cost on e-procurement platform in the website [**www.tender.telangana.gov.in**](http://www.tender.telangana.gov.in) 3. Bidders can log-in to e-procurement platform in secure mode only by signing with the Digital certificates. 4. The Bidders who are desirous of participating in e-tendering shall submit their technical Bids, price Bids as per the standard formats available at the e-procurement platform as per the bid. |
| Any other documents as specified in the ITB |
| 21 |  | **Note**: The Bidder shall upload all the Mandatory Documents **duly attested by the Gazetted Officer in online. Further, the Mandatory document namely Self Declaration, Litigation History, On hand works, critical equipment and any other declarations on Original letter heads to be uploaded with self attestation and need not be attested by the Gazetted officer** and should submit the EMD & hard copies before opening of technical bid, otherwise the bidder will be declared as Disqualified. |
| 22 |  | 1. The Department shall not hold any risk on account of postal delay; similarly, if any of the certificates, documents, etc., furnished by the Bidder are found to be misleading/false/fabricated/bogus, the Bidder will be disqualified and blacklisted duly forfeiting the Bid security.  2. The department will not hold any risk and responsible regarding non-visibility of the scanned and uploaded documents.   1. Important Notice to Contractors, Suppliers Department users   In the endeavor to bring total automation of processes e-Procurement, the Govt. has issued orders vide G.O.Ms.No.13 dated.5-07-2006 permitting integration of electronic Payment Gateway of ICICI/HDFC Banks with e-Procurement platform, which provides a facility to participating suppliers/contractors to electronically pay the transaction fee online using their credit cards. |
| 23 | Rights reserved with the Department | TGSPDCL reserves the right to accept or reject any or all the Bids received without assigning any reasons therefor. |
| 24 | General Terms and Conditions | As per Bid document. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl. No** | **Description of Tender Conditions** | | | |
| **MANDATORY** The Bidder shall upload all the Mandatory Documents **duly attested by the Gazetted Officer in online. Further, the Mandatory document namely Self Declaration, Litigation History, On hand works, critical equipment and any other declarations on Original letter heads to be uploaded with self attestation and need not be attested by the Gazetted officer and should submit the EMD in the form of DD/BG (Original) hard copy or if online payment is done the copy of the same shall be submitted as hard copy and for exemption of EMD the SC/ST Contractors shall submit hard copy of SC/ST certificate issued by the Mandal Tahasildar, on or before last date of bid submission, otherwise the bidder will be declared as Disqualified.** | | | | |
| 1 | **Financial Turnover** | | The bidder should have achieved **a minimum turnover of 50% of Bid value during any one financial year** in the preceding **seven financial years** certified by Chartered Accountant. | |
| 2 | **Bid security** | | **Bid security:** **Valid Bid security @ 2% of ECV** in the form of Online/Demand Draft/BG, DD in favor of TGSPDCL, payable at Hyderabad & the bidders may furnish a BG in original in favour of Chief Engineer/Op/RR Zone/TGSPDCL duly mentioning the Specification No. of the bid & Name of the work from any Scheduled or Nationalized Banks & the validity should not be less than 135 days from the date of bid opening. (As per CGM/Fin Memo.No. 45/23, Dt: 16.06.2023) **Note:** **Exemption of EMD for SC/ST Category Reserved tenders, as per T.O.O. (CE/Civil) Ms. No. 511, Dt. 03-01-2020 & Sp.O.O. (Projects) Ms.No.521, Dt.24-06-2020** i. **Exemption of EMD shall be for the works costing up to 1.00 crore (ECV)**. ii. However, in order to provide level playing field to all, EMD will be recovered from running bills after expenditure of 25% of the concerned works. This will also inculcate the responsibility for completion of the works. The Bonafideness of SC/ ST Contractors shall be considered based on the SC/ ST Certificate issued by the Mandal Tahasildar. | |
| 3 | **Liquid Assets/ Solvency Certificate** | | Copy of Liquid Assets/ Solvency Certificate for not less than **20% of Bid value** and should have been issued by any Scheduled bank or Nationalized bank **not earlier than Twelve Months prior** to the **date of bid opening**. The TGSPDCL reserves the right whereever necessary to make queries with the bidders bankers. | |
| 4 | | **Civil Technical Experience** | | **Civil Technical Experience** |
| (a) | | The bidder should upload a copy of the experience certificate of **50% value of work** as prime contractor (in the same name) **in a consecutive period of 24 months during the preceding 7 Financial years.** The work experience certificate should be issued by an Engineer not below the cadre of the Executive Engineer. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl. No** | | **Description of Tender Conditions** | | | |
| (b) | | **Civil Technical Experience** | To qualify for award of the contract, the bidder should upload a copy of the Experience Certificate of **50% of the following prime quantities** mentioned in the bid document **in consecutive period of 24 months during the preceding 7 Financial years.** | | |
| Description | Estimate Qty | Required Qty |
| (i) | | RCC | 1.964 Cum | 0.982 Cum |
| (ii) | | Steel | 0.175 Tons | 0.087 Tons |
| 5 | | **GST Registration Certificate** | The bidder has to submit the Goods and Services Tax (GST) Registration Certificate. | | |
| 6 | | **Self declaration** | Self declaration by the Bidder in token of having gone through carefully and thoroughly all the terms and conditions mentioned in the Bid document and abide by all the terms and conditions clearly mentioning the Name of the work or Specification no. of the bid. | | |
| 7 | | **EPF & ESI** | The bidder should upload the copies of EPF & ESI Registration Certificates | | |
| 8 | | **Litigation History** | The bidder should upload the information of Litigation History on letter head | | |
| 9 | | **Critical Equipment** | For executing sub-station and line works, the Bidder shall submit a declaration certificate for the availability of CRITICAL EQUIPMENT either owned or leased such as ROLLERS, tractors, JCBs, Cranes, ropes, safety equipment with first aid kit, meggar, Tong tester, CHAIN PULLEY BLOCKS, welding machines, Drilling machines, gas cutters, concrete millers, Pin vibrators, slab vibrators, RCC centering Equipment, Transport vehicles etc, as the case may be. | | |
| 10 | **Qualification certificate of Key personnel** | | Qualification of key person/Site incharge with B.Tech/Diploma in Civil Engineering from Recognized Universities. | | |
| 11 | **TGSPDCL Registration** | | Copy of TGSPDCL Registration of the Vendor | | |
| **Sl.No** | | **Description** | | | |
| **OPTIONAL** | | | | | |
| 12 | Firm Registration/Registered Partnership deed in case of firm (Optional) | | | | |
| 13 | Bidder must furnish the email address for correspondence | | | | |
| 14 | PAN Card | | | | |
| **OTHER SUPPORTING DOCUMENTS** | | | | | |
| 15 | The Bidder should submit the hard copy of all uploaded mandatory documents for verification | | | | |
| 16 | 1. The bidder shall submit a copy of financial turnover in the preceeding seven financial years certified by Chartered Accountant. 2. The bidder shall submit the last seven financial years Profit & Loss statements, Balance Sheets and Income tax return statements supporting the Financial turnover certified by Chartered Accountant. | | | | |

# SECTION 1

# INSTRUCTIONS TO BIDDERS (ITB)

### A. GENERAL

1. **SCOPE OF BID**

1.1 The TGSPDCL (referred to as Employer in these documents) invites bids for the works(as defined in these documents and referred to as “the works”)detailed in the table given in IFB. The bidders should submit bids for the works detailed in the table given in IFB.

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

1. **ELIGIBLE BIDDERS**
   * 1. This Invitation for Bids is open to all bidders. Any materials, equipment, and services to be used in the performance of the Contract shall have their origin in India.
     2. All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a Statement that the Bidder is not associated, nor has been associated in the past, directly or indirectly, with the Consultant or any other entity that has prepared the design, specifications, and other documents for the project or being proposed as Project Manager for the Contract. A firm that has been engaged by the Borrower to provide consulting services for the preparation or supervision of the works, and any of its affiliates shall not be eligible to bid.
     3. Government-owned enterprises in the Employer’s country may only participate if they are legally and financially autonomous, operate under commercial law and are not a dependent agency of the Employer.
     4. Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices in accordance with sub-clause 31.2.
2. **QUALIFICATION OF THE BIDDER**
   1. **To qualify for award of the contract, each Bidder in his name as a prime contractorshould havethe qualification requirementas per clause.No. 24 in NIB.**
   2. All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary.
   3. All bidders shall include the following information and documents with their bids in Section 2 compulsory. Otherwise the bids will be evaluated based on the information available in the Bid.
   4. Copies of original documents defining the constitution or legal status, place of registration, and principal place of business, written power of attorney of the signatory of the Bid to commit the Bidder;
   5. Total monetary value of construction work performed for each year of the last five financial years.
   6. Experience in works of a similar nature and size for each of the last five years, and details of works under way or contractually committed; and clients who may be contacted for further information on those contract;
   7. Major items of construction equipment proposed to carry out the Contract;
   8. Qualifications and experience of key site managements and technical personnel proposed for the Contract should be of Civil Engineering only.
   9. Reports on the financial standing of the Bidder, such as profit and loss statements and auditor’s reports for the past five financial years.
   10. Evidence of adequacy if working capital for this contract (access to line (s) of credit and availability of other financial resources).
   11. Authority to seek references from the Bidder’s bankers:
   12. Information regarding any litigation, current or during the last five years, in which the Bidder is involved, the parties concerned, and disputed amount.
   13. The proposed methodology of construction, backed with their construction equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of achieving the completion of work as per milestones specified within the stipulated period of completion.
   14. Financial turnover should be certified by Chartered Accountant.

3.4 **a) Bids from joint ventures are not acceptable.**

b) The sub agencies can be appointed for execution by the principle contractor under due approval of the Employer basing on the competence and capacity of such proposed sub agency.

3.5 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified and black listed if they have:

1. made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or
2. Record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completions, litigation history, or financial failures etc.
3. The bidder should provide detailed information on any litigation or arbitration arising out of contracts completed or under execution by it over the last five years. A consistent history of awards involving litigation against the Bidder may result in rejection of Bid.

3.6 All the materials to be utilized for the project should be subjected for inspection before dispatch. The cost of the inspection shall be born by the bidder. The contractor shall intimate the Employer, the bar chart for procurement of various items and execution, enabling the concerned officer to arrange for inspection of such materials. The original invoices of purchases must be enclosed along with the bill for payment.

3.7 The bidders have to furnish an undertaking in the prescribed format given in Section-2 disclosing their relationship with the officers/Chief General Managers of TRANSCO / DISCOM. Any false information furnished in the declaration will render the contract liable fortermination as well as recovery of damages.

3.8 Notwithstanding anything stated above the owner reserves the right to asses capability and capacity of the bidder to successfully execute the work covered under the package within stipulated completion period. This assessment shall inter-alia include (i) document verification (ii) bidder’s work/ manufacturing facilities visit (iii) manufacturing capacity, details of work executed, works in hand, anticipated in future in addition to the works involved in present bid (iv) details of plant and machinery, manufacturing and testing facilities, manpower and financial resources (v) details of quality systems in place (vi) past experience and performance (vii) customer feedback (viii) banker’s feedback etc.

1. **COST OF BIDDING**

The bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible and liable for those costs.

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

#### B. BIDDING DOCUMENTS

1. **CONTENT OF BIDDING DOCUMENTS**
   1. The set of bidding documents comprises the documents listed in the table below and addendum issued in accordance with Clause 8:

Section Invitation for Bids

Instruction to Bidders

Forms of Bid and Qualification Information

Conditions of Contract

Contract Data

Technical Specifications

Bill of Quantities

Forms of securities

1. **CLARIFICATION OF BIDDING DOCUMENTS**

A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing or by cable e-mail or FAX at the Employer’s address indicated in the invitation to bid. The Employer will respond for clarification, which he received earlier than 7 days prior to the deadline for submission of bids. Copies of the Employer’s response will be forwarded to all purchases of the bidding documents, including a description of the enquiry but without identifying its source.

1. **AMENDEMENT OF BIDDING DOCUMENTS**

8.1 Before the deadline for submission of bids, the Employer may modify the bidding documents by issuing amendment. The same will be communicated through e-procurement platform and also in TGSPDCL website.

8.2 Any amendment thus issued shall be part of the biding documents and shall be communicated through e-procurement platform and also in TGSPDCL website.

8.3 To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer shall extend as necessary the deadline for submission of bids, in accordance with Sub-Clause 18.2. below, and the same will be communicated through e-procurement platform and also in TGSPDCL website

##### C. PREPARATION OF BIDS

**9. LANGUAGE OF THE BID**

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

**10. DOCUMENTS COMPRISING THE BID**

The bid submitted by bidder shall comprise the following:

1. Bid Security as per clause 14 of ITB (Original)
2. Technical Bid information

And any other materials required be completing and submitting by bidders in accordance with these instructions. The documents listed under Sections 2.4 and 7 of Sub-Clause 6.1 shall be filled in without exception.

**11. BID PRICES**

* 1. The contract shall be for whole works as described in Sub-Clause 1.1.

,

* 1. The Bidder has to quote his rate which shall be inclusive of all costs of inspection & testing of equipment/ material by the nominated representative of the employer for each batch of equipment/ material manufacture on e-procurement site.

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

11.4 The rates and prices quoted by the bidder shall be fixed

**12. CURRENCIES OF BID AND PAYMENT**

The bidder entirely in Indian Rupees shall quote the unit rates and the prices.

**13. BID VALIDITY**

* 1. Bids shall remain valid for a period not less than One Thirty Five (135)days after the deadline date of bid submission specified. A Bid valid for a shorter period shall be rejected by the employer as non-responsive.

13.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the bidders may extend the period of validity for a specified additional period. The request and the bidder’s responses shall be made in writing or by cable. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his bid security for a period of the extension, and in compliance with Clause 14 in all respects.

**14. BID SECURITY**

* 1. The Bidder shall furnish, as part of his Bid, a Bid security compulsorily as shown in column 9 of the table of IFB for this particular work. This bid security shall be in the form **of** Online/DD/BG, Demand Draft in favor of TGSPDCL payable at Hyderabad & the bidder may furnish a BG in original in favour of CE/OP/RR Zone duly mentioning the Specification No of the bid & name of the work from any Scheduled or Nationalized Banks & the validity should not be less than 135 days from the date of bid Opening.
  2. Any bid not accompanied by an acceptable Bid Security and not secured as indicated in Sub-Clauses 14.1 can be rejected by the employer as non-responsive.
  3. The Bid Security of the un successful bidder will be returned after fixing up of agency.
  4. The Bid Security of the Successful bidder will be discharged when the bidder has signed the Agreement and furnished the required Performance Security.
  5. The Bid Security may be forfeited

1. If the Bidder withdraws the Bid after Bid opening during the period of Bid validity:
2. If the Bidder does not accept the correction of the Bid Price, pursuant to Clause 25 or
3. In the case of successful Bidder, if the Bidder fails within the specified time limit to
   1. sign the Agreement or
   2. furnish the required Performance Security.
4. **ALTERNATIVE PROPOSALS BY BIDDERS**
   1. Bidder shall submit offers that comply with the requirements of the bidding documents, including the basic technical design as indicated in the drawing and specifications. Alternatives will not be considered.
   2. **However any variation or deviation from the works proposed in the bids specification (Provision of works in the scheme) if found necessary as per the field conditions shall be got approved by the Superintending Engineer / concerned.**

**In turn Superintending Engineer / Concerned for any variation or deviation from the works proposed in the bids specification (i.e. Provision of works in the scheme) shall take approval of the Corporate Office before approving the same and getting it executed by the contractor.**

1. **FORMAT AND SIGNING OF BID**

16.1 If the tender is made by an individual, it shall be signed with his full name and his address shall be given. If it is made by a firm, it shall be signed with the co-partnership name by a member of the firm, who shall also sign his own name, and the name and address of each member of the firm shall be given, if the tender is made by a corporation it shall be signed by a duly authorized officer who shall produce with his tender satisfactory evidence of his authorization. Such tendering corporation may be required before the contract is executed, to furnish evidence of its corporate existence. Tenders signed on behalf of G.P.A holder will be rejected.

* 1. The tender shall contain no alterations or additions, except those to comply with instructions issued by the tender inviting officer, or as necessary to correct errors made by the tenderer, in which case all such corrections shall be initialized by the person signing the tender.
  2. The Bid shall contain no alterations or additions, except those to comply with instructions, issued by the Employer, or as necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.
  3. The Bidder shall furnish information as described in the form of Bid on commissions or gratuities, if any, paid or to be paid to agents relating to the Bid, and to contract execution if the Bidder is awarded the contract.

###### D. SUBMISSION OF BIDS

**17. SEALING AND MARKING OF BIDS**

17.1 The Bidder shall submit bids on e-procurement platform only and **Hard copies of** uploaded documents only along with **2.0% bid security original Online/DD/BG**sealed as part of technical bid subject to fulfillment of other required obligations of the bid document. The Bid evaluation of the Tenderers will be done based on the certificates /documents uploaded through online only towards qualification criteria furnished by them.

* 1. The tenderer has to submit the hard copies of all the uploaded documents with in the stipulated time.
  2. The tenderer shall invariably furnish the hard copy original **Online/DD/BG**towards EMD and other hard copies of the uploaded documents to the tender inviting authority as mentioned in Sl.No. 13 in NIB either personally or through courier or by post and the receipt of the same within the stipulated time shall be the responsibility of the bidder. Department will not take any responsibility for any delay or non receipt.
  3. The participating bidders shall electronically pay the transaction fee through online (i.e., 0.03% of E.C.V plus 18%GST) as per E-procurement website.

The payment of transaction fee by the participating Bidders through the electronic payment Gateway to the service provider is made mandatory as per GO Ms No 13 information technology & communication department, e-procurement dated 05-07-2006 & GO Ms No 11 IT & C department dated 5-5-2007 or as per the E-Procurement site and as and when amended.

17.5 The successful (L1) tenderer shall furnish the original hard copies of all the documents / certificates / statements uploaded by them before concluding the Agreement.

1. **DEADLINE FOR SUBMISSION OF THE BIDS**
   1. Bids must be submitted not later than the date and time specified in NIT. In the event of the specified date / time for the submission of bids declared as holiday, the bids will be received on the next working day.
   2. The employer may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 8, in which case all rights and obligations of the Employer and the bidder previously subject to the original deadline will then be subject to the new deadline.

**19. LATE BIDS**

Hard copies received after the last date and time prescribed in NIT will be summarily rejected.

1. **MODIFICATION AND WITHDRAWAL OF BIDS**
   1. No tender shall be modified after the last date / time of submission of tenders.
   2. No bid may be modified after the deadline for submission of Bids.

E. BID OPENING AND EVALUATION

1. **BID OPENING**
   1. The tenderers or their authorised representatives can be present at the time of opening of the tenders. Either the tenderer himself or one of his representative with proper authorisation only will be allowed at the time of tender opening. If any of the tenderer is not present at the time of opening of tenders, the tender opening authority will, on opening the tender of the absentee tenderer, reads out and record the deficiencies if any, which shall be binding on the tenderer.
   2. The technical bid containing qualification requirements as per requirement will be evaluated by the tender opening authority and the minutes are recorded which will be signed by the tender opening authority as well as tenderers or their authorized representatives present.

1. **PROCESS TO BE CONFIDENTIAL**
   1. Information relating to the examination, clarification, evaluation, and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. Any effort by a Bidder to influence the Employer’s processing of Bids or award decisions may result in the rejection of his Bid.
2. **CLARIFICTION OF BIDS**
   1. To assist in the examination, evaluation, and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his Bid, including breakdowns of unit rates. The request for clarification and the responses shall be in writing or by cable, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids in accordance with Clause 25.
   2. Subject to Sub-Clause 23.1, no Bidder shall contact the Employer on any matter relating to its bid from the time of the bidding opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Employer, he should do so in writing.
   3. Any effort by the Bidder to influence the Employer in the Employer’s bid evaluation, bid comparison or contract award decisions may result in the rejection of the Bidder’s bid.
3. **EXAMINATION OF BIDS AND DETERMINATION OF RESPONSIVENESS**
   1. Prior to the detailed evaluation of Bids, the Employer will determine whether each Bid (a) meets the eligibility criteria defined in Clause 2; (b) has been properly signed; (c) is accompanied by the required securities and; (d) is substantially responsive to the requirements of the Bidding documents.
   2. A substantially responsive Bid is one, which conforms to all the terms, conditions, and specifications of the Bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works (b) which limits in any substantial way, inconsistent with the Bidding documents, the Employer’s rights or the Bidder’s obligations under the Contract, or (c) whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids.
   3. If a Bid is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-confirming deviation or reservation.

1. **EVALUATION AND COMPARISON OF BIDS**
   1. The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Clause 24.
   2. Selection of tenderer among the lowest and equally quoted tenderers will be in the following orders:
2. The tenderer whose bid capacity is higher will be selected.
3. In case the bid capacity is also same the tenderer whose annual turnover is more will be preferred.
4. Even if the criteria incidentally become the same, the turnover on similar works and thereafter machinery available for the work and then the clean track record will be considered for selection.
5. **DISCRIPENCY IN PERCENTAGE QUOTED**
   1. In case of any discrepancy between the overall tender percentage quoted in words and figures, the percentage quoted in words shall prevail. In case the tenderer has quoted overall tender percentage only in words and not in figures or vice versa, such tender shall be treated as incomplete and rejected.
   2. The Employer reserves the right to accept or reject any variation, deviation, or alternative offer. Variation, deviations, and alternative offers and other factors which are in excess of the requirements of the Bidding documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Bid evaluation.
   3. If the Bid of the successful Bidder is seriously unbalanced in relation to the Engineer’s estimate of the cost of work to be performed under the contract, the Employer 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 analyses, the Employer may require that the amount of the performance security set forth in Clause 30 be increased at the expense of the successful Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

F. AWARD OF CONTRACT

* + 1. **27. AWARD CRITERIA**
  1. Subject to Clause 28, the Employer will award the Contract to the Bidder whose Bid has been determined to be substantially responsive to the Bidding documents and who has offered the lowest evaluated Bid Price, provided that such Bidder has been determined to be (a) eligible in accordance with the provisions of Clause2, and (b) qualified in accordance with the provisions of Clause 3.

**28. EMPLOYER’S RIGHT TO ACCEPT ANY BID TO REJECT ANY OR ALL BIDS**

28.1 Notwithstanding Clause 27, the Employer reserves the right to accept or reject any Bid, and to cancel the Bidding process and reject all Bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Employer’s action.

**29. NOTIFICATION OF AWARD AND SIGNING OF AGREEMENT**

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

works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the “Contract Price”).

29.2 The notification of award will constitute the formation of the Contract, subject only to the furnishing of a performance security in accordance with the provisions of Clause 30.

29.3 The Agreement will incorporate all agreements between the Employer and the successful Bidder. It will be signed by the employer and sent to the successful Bidder, within 28 days following the notification of award along with the Letter of Acceptance. Within 21 days of receipt of LOI, the successful Bidder will sign the Agreement and deliver it to the Employer.

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

* + 1. **30.PERFORMANCE SECURITY**

30.1 Within 21 days of receipt of the Letter of Acceptance, the Successful Bidder shall deliver to the employer a Performance Security in any of the forms given below for an amount equivalent to 5% of the Contract price plus additional security for unbalanced Bids in accordance with Clause 30.4

* + - * + a bank guarantee in the form given in Section 8 ; or
        + DD in favour of TGSPDCL &Bank Guarantee (with extra GST@18%) in favour of Chief Engineer/Op/RR Zone from any scheduled or nationalized bank.

30.2 If the performance security is provided by the successful Bidder in the form of a Bank Guarantee, it shall be issued either (a) at the Bidder’s option, by Nationalized/ Scheduled Indian Bank or (b) by a foreign Bank located in India and accepted to the Employer.

30.3 Failure of the successful Bidder to comply with the requirements of Sub-Clause 30.1 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Bid Security.

* 1. In Event of tender amount are quoted less by more than 10% of the Estimate the bidder has to accept the tender by obtaining bank guarantee (with extra GST@18%)/DD for the differencebetween the tendered amount and 90% of the estimate value.

**31. CORRUPT OR FRAUDULENT PRACTICES.**

31.1 Employer expects that Bidders/Suppliers/Contractors observe the highest standard of ethics during the procurement and execution of such contracts.

In pursuance of this policy, the Employer.

1. Defines, for the purposes of this provision, the terms set forth below as follows:
2. “Corrupt practice” means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution, and
3. “Fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the determent of the Employer, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.
4. Will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question.
5. Will declare a firm ineligible, either indefinitely or for a stated period of time, if Employer any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing TGSPDCL contract.

31.2 Furthermore, Bidders shall be aware of the provision stated in sub-clause 22.2 and sub clause 52.2 of the General Conditions of Contract.

SECTION 2

FORMS OF BID, QUALIFICATION INFORMATION AND LETTER OF ACCEPTANCE

TABLE OF FORMS:

* CONTRACTOR’S BID
* QUALIFICATIONS INFORMATION
* LETTER OF ACCEPTANCE
* NOTICE TO PROCEED WITH THE WORK
* PERFORMANCE SECURITY
* AGREEMENT FORM

CONTRACTOR’S BID

Description of the Works:-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**To**

The Chief Engineer

Ranga Reddy Zone, TGSPDCL,

KPHB Colony, Hyderabad – 72.

Gentlemen,

We offer to execute the works described above in accordance with the Conditions of contract accompanying this Bid for the Contract Price of ------------------------(in figures) (-----------------------------------------------------------------------------) in letters.

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

Commission or gratuities, if any, paid or to be paid by us to agents relating to this Bid, and to contract execution if we are awarded the contract, are listed below:

Name and address of agent Amount Purpose of Commission or gratuity

…………………………… ………… ………………………………………

……………………………. …………. ……………….………………………

……………………………. ………… ………………………………………

(if none, state “none”)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

We hereby confirm that this Bid complies with the Bid Validity and Bid Security required by the Bidding documents.

We attach herewith our current income-tax clearance certificate.

Yours faithfully,

Authorized Signature:

Name & Title of Signatory: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name of Bidder: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Address:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. To be filled by Bidder, together with his particulars and date of submission at the bottom of the form of Bid.

..

QUALIFICATION INFORMATION

The information to be filled in by the Bidder in the following pages will be used for purposes of post-qualification as provided for in Clause 3 of the Instructions to Bidders. This information will not be incorporated in the Contract.

* + 1. For Individual Bidders
  1. Constitution of legal status of Bidder (Attach Copy)

Place of Registration: (Attach copy)

Principal place of business:

Power of Attorney of Signatory of Bid (Attach copy)

* 1. Total value of Civil Engineering Construction

Work performed in the last five years

(in Rs. Lakhs) for the period mentioned in caluse.No.20.6.4.

* + 1. Work performed as prime contractor (in the same name) on works of a similar nature over the last five years.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project Name** | **Name of Employer** | **Description of work** | **Agreement/Contract No.& Date of Agreement** | **Value of contract**  **(Rs. Lakhs)** | **Date of Commencement of work** | **Stipulated period of completion** | **Actual date of completion** | **Remarks Explaining reasons for delay in work completion** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

* + 1. Quantities of work executed as prime contractor (in the same name and style) as mentioned in caluse No. 20.6.1

.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Name of the work | Qty | Amount (Rs. lakhs) | Remarks \* (Indicate contract ref.) |
|  |  |  |  |  |

Enclosed certificate(s) from the Engineer(s) in-Charge.

@ The item of work for which data is requested should tally with that specified in ITB clause 3.4(A) & 3.4(C )

\* Immediately proceeding the financial year in which bids are received as mentioned in ITB

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

(A) Existing commitments and on-going works:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Description of work | Place & State | Contract No. & Date | Name and Address of Employer | Value of Contract (Rs.Lakhs) | Stipulated period of completion (Rs.lakhs) | Value of works \* remaining to be completed | Anticipated date of completion |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |

1. Works for which bids already submitted:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Description of work | Place & State | Estimated value of works (Rs.lakhs) | Stipulated period of completion | Date when decision is completed | Remarks if any expected |
| (1) | (2) | (3) | (4) | (5) | (6) |

\*Enclosed certificate (s) from the Engineer(s)-in-Charge.

* 1. The following items of Contractors Equipment are essential for carrying out the Works. The Bidder should list all the information requested below. Refer also to Sub Clause 3.2 (d) of the Instructions to Bidders.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Item of Requirement Availability proposals Remarks

Equipment No.Capacity Owned/leased Nos./ Age/ (from whom to be procured capacity condition to be purchased)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. List and educational qualification certificates of key personnel. The key personal/Site incharge should be of Civil Engineering for Civil works and experience of key personnel proposed for administration and execution of the contract. Attach biographical data. Refer also to Sub Clause 3.2 (e) of instructions to Bidder and Sub Clause 8.1 of the Conditions of Contract.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Position Name Qualifications Years of Years of experience in

Experience the proposed position

(general) Project Manager

Etc.

* 1. Financial reports for the last five years: balance sheets, profit and loss statements, auditors report (in case of companies / corporation) etc. List them below and attach copies.
  2. Evidence of access to Financial resources to meet the qualification requirements: cash in hand, lines of credit, etc., List them below and attach copies of support documents.
  3. Name, address and telephone, telex, and fax numbers of the Bidders’ bankers who may provide references if contacted by the Employer.
  4. Performance certificate for the works executed is to be furnished
  5. Information on litigation history in which the Bidder is involved.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Other party(ies) Employer Cause of dispute Amount Remarks showing

Involved present status \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. Statement of compliance under the requirements of Sub Clause 3.2 of the instructions to Bidders.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. Proposed work method and schedule. The Bidder should attach descriptions, drawings and charts as necessary to comply with the requirements of the Bidding documents. (Refer ITB Clause 3.1 and 3.2 (k))

1. Additional Requirements

2.1 Bidders should provide any additional information required to fulfill the requirements of Clause 3 of the Instructions to the Bidders, if applicable.

LETTER OF ACCEPTANCE

(Letterhead paper of the Employer)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(date)

To

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (name and address of the Contractor)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dear Sirs:

This is to notify you that your Bid dated \_\_\_\_\_\_\_\_\_\_\_\_\_\_ for execution of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[name of the contract and identification number, as given in Instruction to Bidder]1 for the Contract Price of Rupees \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(\_\_\_\_\_\_\_\_\_\_\_\_\_) [Amount in words and figures], as corrected and modified in accordance with the instructions to Bidders’ is hereby accepted by our Agency.

You are hereby requested to furnish Performance Security, plus additional security for unbalanced bids in terms of ITB clause 26.4 in the form detailed in Para 30.1 of ITB for an amount of Rs.\_\_\_\_\_\_\_\_ within 21 days of the receipt of this letter of acceptance valid upto 28 days from the date of expiry of Defects Liability Period i.e. upto. ………and sign the contract, failing which action as stated in Para 30.3 of ITB will be taken.

Yours faithfully,

Authorized Signature

Name and Title of Signatory

Name of Agency

1. Delete “correct and” or “and modified” if only one of these actions applies. Delete “as corrected and modified in accordance with the Instructions to Bidders” if corrections or modifications have not been effected.
2. To be used only if the Contractor disagrees in his Bid with the Technical Expert proposed by the Employer in the “Instructions to Bidders”.

ISSUE OF NOTICE TO PROCEED WITH THE WORK

(letterhead of the Employer)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(date)

To

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(name and address of the Contractor)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dear Sirs:

Pursuant to your furnishing the requisite security as stipulated in ITB clause 30.1 and signing of the contract for the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ @ Bid Price of Rs. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ you are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Yours faithfully,

(Signature, name and title of Signatory

authorized to sign on behalf of Employer)

AGREEMENT FORM

Agreement

The agreement, made the\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ day of \_\_\_\_\_\_\_\_\_\_\_\_\_2015\_\_\_\_\_\_\_\_\_\_ between\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_[name and address of Employer]

(hereinafter called “the employer)” and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_[name and address of contractor] (hereinafter called “the Contractor” of the other part).

Whereas the Employer is desirous that the Contractor execute \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)name and identification number of Contract] (hereinafter called “The Works”) and the Employer has accepted the Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein, at a cost of Rs…………………………………………………………………….

NOW THIS AGREEMENT WITNESSTH as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively as signed to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.
2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein conformity in all aspects with the provisions of the Contract.
3. The Employer hereby covenants to pay the contractor in consideration of the execution and completion of the Works and remedying the defects where in the Contract Price or such other sum as may become payable under provisions of the Contract at the times and in the manner prescribed by the Contract.
4. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:
   1. Letter of Acceptance;
   2. Notice to proceed with the works;
   3. Contractor’s Bid;
   4. Contract Data;
   5. Conditions of Contract;
   6. Specifications;
   7. Drawings;
   8. Bill of Quantities; and
   9. Any other document listed in the Contract Data as forming part of the Contract.

In witness whereof the parties there to have caused this Agreement to be executed the day and year first before written.

The Common Seal of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Was hereunto affixed in the presence of:

Signed, Sealed and Delivered by the said \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

in the presence of:

Binding Signature of Employer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Binding Signature of Employer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SECTION 3

CONDITIONS OF CONTRACT

**CONDITIONS OF CONTRACT**

### TABLE OF CONTENTS

A. GENERAL

1. Definitions

2. Interpretation

3. Language and Law

4. Engineer’s Decisions

5. Delegation

6. Communications

7. Subcontracting

8. Other Contractors

9. Personnel

10. Employer’s & Contractor’s Risks

11. Employer’s Risks

12. Contractor’s Risks

13. Insurance

14. Site Investigation Reports

15. Queries about the Contract Data

16. Contractor to Construct the Works

17. The Works to be completed by the

Intended completion date

18. Approval by Engineer

1. Safety

20. Discoveries

21. Possession of the Site

1. Access to the Site

23. Instructions

1. Disputes

B. TIME CONTROL

25. Program

26. Extension of the Intended Completion Date

27. Delays Ordered by the Engineer

28. Management Meetings

29. Early Warning

C. QUALITY CONTROL

30. Identifying Defects

31. Tests

32. Corrections of Defects

33. Uncorrected Defects

D. COST CONTROL

34. Bill of Quantities

35. Changes in the Quantities

36. Variations

37. Payments for Variations

38. Cash Flow Forecasts

39. Payment Certificates

40. Payments

41. Compensation Events

42. Tax

43. Currencies

44. Retention

45. Liquidated Damages

46. Securities

47. Cost of Repairs

E.FINISHING THE CONTRACT

48. Completion

49. Taking Over

50. Final Account

1. Operating and Maintenance Manuals
2. Termination
3. Payment upon Termination
4. Property
5. Release from Performance

CONDITIONS OF CONTRACT

A.GENERAL

1. **DEFINITIONS**
   1. Terms which are defined in the Contract Data are also defined in the Conditions of Contract but keep their defined meanings. Capital initials are used to identify defined terms.

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

Compensation Events are those defined in Clause 41 hereunder.

The Completion Date is the date of completion of the Works as certified by the Engineer in accordance with Sub Clause 48.2

The Contract is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.3 below.

The Contract Data defines the documents and other information which comprise the bid accepted by the Employer

The Contractor’s Bid is the completed Bidding document submitted by the Contractor to the Employer

The Contract Price is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Days are calendar days; months are calendar months.

The Defects Liability Period is the period named in the Contract Data and calculated from the Completion Date.

The Employer is the party who will employ the Contractor to carry out the works.

The Engineer is the person named in the Contract Data (or any other competent person appointed and notified to the contractor to act in replacement of the Engineer) who is responsible for supervising the Contract, administering the Contract, certifying payments due to the Contractor, issuing and valuing Variations to the Contract, awarding extensions of time, and valuing the Compensation Events.

Equipment is the Contractor’s machinery and vehicles brought temporarily to the Site to construct the Works.

The Initial Contract Price is the Contract Price listed in the Employer’s Letter of Acceptance.

The Intended Completion Date is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Engineer by issuing an extension of time.

Materials are all supplies, including consumables, used by the Contractor for incorporation in the Works.

Plant is any integral part of the Works which is to have a mechanical, electrical, electronic or chemical or biological function.

The Site is the area defined as such in the Contract Data.

Site Investigation Reports are those which were included in the Bidding documents and are factual interpretative reports about the surface and sub-surface conditions at the site.

Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Engineer.

The Start Date is given in the Contract Data. It is the date when the Contractor shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Dates.

A Subcontractor is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract which includes work on the Site.

Temporary Works are works designed, constructed, installed, and removed by the Contractor which are needed for construction or installation of the Works.

A Variation is an instruction given by the Engineer which varies the Works.

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

1. **INTERPRETATION**
   1. In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Engineer will provide instructions clarifying queries about the Conditions of Contract.
   2. If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works the Completion Date, and the Intended Completion Date apply to any Section of the works (other than references to the Completion Date and Intended Completion date for the whole of the Works).
   3. The documents forming the Contract shall be interpreted in the following order of priority:
2. Agreement
3. Letter of Acceptance, notice to proceed with the works.
4. Contractor’s Bid
5. Contract Data
6. Conditions of Contract
7. Specifications
8. Drawings
9. Bill of quantities and
10. Any other document listed in the Contract Data as forming part of the Contract.
11. Amendments/ Pre Bid decision if any
12. **LANGUAGE AND LAW**

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

1. **ENGINEERS DECISIONS**

Except where otherwise specifically stated, the Engineer will decide contractual matters between the Employer and the Contractor in the role representing the Employer.

1. **DELEGATION**

The Engineer may delegate any of his duties and responsibilities to other people except to the Adjudicator after notifying the Contractor and may cancel any delegation after notifying the Contractor.

1. **COMMUNICATIONS**

Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract Act.)

1. **OTHER CONTRACTORS**

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

1. **PERSONNEL**
   1. The Contractor shall employ the key personnel named in the Schedule of Key Personnel as referred to in the Contract Data to carry out the functions stated in the Schedule of other personnel approved by the Engineer. The Engineer will approve any proposed replacement of key personnel only if their qualifications, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the Schedule.
   2. If the Engineer asks the Contractor to remove a person who is a member of the Contractor’s staff or his work force stating the reasons the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.
2. **EMPLOYER’S AND CONTRACTOR’S RISKS**

The Employer carries the risks which the Contract states are Employer’s risks, and Contractor carries the risks which this Contract states are Contractor’s risks.

1. **EMPLOYER’S RISKS**

The Employer is responsible for the excepted risks which are(a) in so far as they directly affect the execution of the Works in the Employer’s country, 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 radio active toxic explosive or (b) a cause due solely to the design of the Works, other than the Contractor’s design.

1. **CONTRACTOR’S RISKS**

All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

1. **INSURANCE**
   1. The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the start Date to the end of the Defects Liability Period, in the amounts and deductibles stated into the Contract Data for the following events which are due to the Contractor’s risks:
   2. loss of or damage to the Works, Plant and Materials;
   3. loss of or damage to Equipment
   4. loss of or damage of property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and
   5. personal injury or death.
   6. Policies and certificates for insurances shall be delivered by the Contractor to the Engineer for the Engineer’s approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred
   7. If the Contractor does not provide any of the policies and certificates required, the Employer may affect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.
   8. Alterations to the terms of an insurance shall not be made without the approval of the Engineer.
   9. Both parties shall comply with any conditions of the insurance policies.
2. **SITE INVESTIGATION REPORTS**

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

1. **QUERIES ABOUT THE CONTRACT DATA**

The Engineer will clarify queries on the Contract Data.

1. **CONTRACTOR TO CONSTRUCT THE WORKS**

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

1. **THE WORKS TO BE COMPLETED BY THE INTENDED COMPLETION DATE**

The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the program submitted by the Contractor as updated with the approval of the Engineer, and complete them by the intended completion Date.

1. **APPROVAL BY THE ENGINEER**
   1. The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Engineer, who is to approve them if they comply with the Specifications and Drawings.
   2. The Contractor shall be responsible for design of Temporary Works.
   3. The Engineer’s approval shall not alter the Contractor’s responsibility for design of the Temporary Works.
   4. The Contractor shall obtain approval of third parties to the design of the Temporary Works where required.
   5. All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Engineer before their use.
2. **SAFETY**

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

1. **DISCOVERIES**

Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Employer. The Contractor is to notify the Engineer of such discoveries and carry out the Engineer’s instructions for dealing with them.

1. **POSSESSION OF THE SITE**

The Employer shall give possession of all parts of the Site to the Contractor by the date stated in the contract data, for execution of works.

1. **ACCESS TO THE SITE**

The Contract shall allow the Engineer and any person authorized by the Engineer access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured/fabricated/assembled for the works.

1. **INSTRUCTIONS**
   1. The Contractor shall carryout all instructions of the Engineer which comply with the applicable laws where the Site is located.
   2. The Contractor shall permit employer or his representative to inspect the Contractor’s accounts and records relating to the performance of the Contractor.
2. **DISPUTES**

If the Contractor believes that a decision taken by the Engineer was either outside the authority given to the Engineer by the Contract or that the decision was wrongly taken, the decision shall be referred to the Arbitrator within 14 days of the notification of the Engineer’s decision.

# B .TIME CONTROL

**25. PROGRAME**

* 1. Within the time stated in the Contract Data the Contractor shall submit to the Engineer for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works along with monthly cash flow forecast.
  2. An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.
  3. The Contractor shall submit to the Engineer, for approval, an updated Program at intervals no longer than the period stated in the Contract Data. If the Contractor does not submit an updated Program within the period, the Engineer may with hold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted.
  4. The Engineer’s approval of the Program shall not alter the Contractor’s obligations. The Contractor may revise the Program and submit it to the Engineer again at any time. A revised Program is to show the effect of variations and Compensations Events.

**26. EXTENSION OF THE INTENDED COMPLETION DATE**

* 1. The Engineer shall extend the Intended Completion Date if a Compensation Event occurs or various is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work and which would cause the Contractor to incur additional cost.
  2. The Engineer shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Engineer for a decision upon the effect of a Compensation Event or variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new intended completion Date.

1. **DELAYS ORDERED BY THE ENGINEER**

The Engineer may instruct the Contractor to delay the start or progress of any activity within the Works.

**28. MANAGEMENT MEETINGS**

* 1. Either the Engineer or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.
  2. The Engineer shall record the business of management meetings and is to provide copies of his record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken is to be decided by the Engineer either at the management meeting or after the management meeting and stated in writing to all who attended the me.

**29. EARLY WARNING**

* 1. The Contractor is to warn the Engineer at the earliest opportunity of specific likely future events of circumstances that may adversely affect the quality of the work, increase the Contract Price or delay the execution of works. The Engineer may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate is to be provided by the Contractor as soon as reasonably possible.
  2. The Contractor shall cooperate with the Engineer in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Engineer.
     1. **QUALITY CONTROL**

**30. IDENTIFYING DEFECTS**

The Engineer shall check the Contractor’s work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor’s responsibilities. The Engineer may instruct the Contractor to search for a Defect and to uncover and test any work that the Engineer considers may have a Defect.

# 30.1 QUALITY ASSURANCE

# 30.1.1 QUALITY ASSURANCE PROGRAMME

To ensure that the equipment are in accordance with the specifications, the contractor shall adopt suitable quality assurance programme to control such activities at all points, as necessary. Such programme shall be out lined by the contractor and shall be finally accepted by owner / authorized representative after discussions before the award of contract. The QA programme shall be generally in line with ISO-9000/IS-14000. A quality assurance programme of the contractor shall generally cover the following:

1. His organization structure for the management and implementation of the proposed quality assurance programme.
2. Quality system manual
3. Design control system
4. Documentation control system
5. Qualification data for bidder’s key personnel.
6. The procedure for purchase of material, parts, components and selection of sub vendors service including vendor analysis, source inspection, incoming raw material inspection, verification of materials purchased etc.
7. System for shop manufacturing control including process controls, fabrication and assembly controls.
8. Control of non conforming items and systems for corrective actions
9. Inspection and test procedure
10. Control of calibration and testing of measuring and testing equipment
11. System for indication and appraisal of inspection status
12. System for quality audit
13. System for authorizing release of manufactured product to owner
14. System for maintenance of records
15. System for handling storage and delivery
16. All the plant standard / written down practices followed by the manufacturing / contractor against the manufacturing activities in their works will be submitted in electronic media preferably in at least one set of compact discs.

## 30.1.2 GENERAL REQUIREMENTS – QUALITY ASSURANCE

All materials, components and equipment covered under this specification shall be procedure manufactured and tested at all the stages, as per a comprehensive quality programme. An indicative programme of inspection / tests to be carried out by the contractor for some of the major items is given in this specification. This is however, not intended to form a comprehensive programme as it is the contractor’s responsibility to draw up and implement such programme duly approved by the Owner. The detailed quality plans for the manufacturing activities should be drawn up by the bidder, and will be submitted to Owner for approval. Schedule for finalization of such quality plans will be finalized before award.

Manufacturing quality plan shall detail out for all the components and equipments, various tests, inspection, to be carried out as per the requirements to this specification and standards mentioned therein and quality practices and procedures followed by contractor’s Quality Control Organization, the relevant reference documents and standards acceptance norms, inspection documents raised etc., during all stages of material procurement, manufacture, assembly and final testing / performance testing.

The Bidder shall also furnish copies of the reference documents/ Plant Standard / Acceptance norms / Test and inspection procedure etc. as referred in Quality Plan along with Quality Plans. The Quality Plans and reference documents / standards etc, will be subject to Owner’s approval and will form a part of the contract. In these approved Quality Plan, Owner shall identify customer hold points (CHP) which shall be carried out in presence of the Owner’s Project Manager and beyond which work shall not proceed without, written consent of Owner’s Project Manager / Authorised representative in writing. All deviation to this specifications, approved quality plans and applicable standard much be documented and referred to Owner along with technical justification for approval and dispositioning.

No material shall be dispatched from the manufactures works before the same is accepted subsequent to pre-despatch final inspection including verification of records of all previous tests/ inspections by Owner’s Project Manager / Authorised representative and duly authorized for dispatch issuance of MDCC.

All materials used and supplied shall be accompanied by valid and approved materials certificates and tests and inspection reports. These certificates and reports shall indicate the heat numbers or other such acceptance identical numbers of the material. The material certified shall also have the identification details stamped on it.

All materials used for equipment manufacture including casting and forging etc. shall be of tested quality as per relevant codes / Standard. Details of results of the tests conducted to determine the mechanical properties, chemical analysis and details of heat treatment procedure recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and / or agreed details.

All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX / BS –4870 or other International equivalent standard acceptable to the Owner.

All welding / brazing procedure shall be submitted to the Owner or its authorized representative for approval prior to carrying out the welding / brazing

All brazers, welders and welding operators, employed on any part of the contract either in Contract’s / his Sub- Contractors works or at site elsewhere shall be qualified as per ASME Section IX or BS-4871 or other equivalent International Standards acceptable to the Owner.

Test results of qualification tests and specimen testing shall be furnished to the Owner for approval. However where required by the Owner, tests shall be conducted in presence of Owner / Authorised representative

All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.

Results of al non-destructive testing shall be recorded on certificates.

All the sub-vendors proposed by the contractor for procurement of major bought out item including castings, forgings, semi-finished and finished components/equipment, list of which shall be drawn up by the Contractor and finalized with the Owner shall be subject to Owner’s approval. The Contractor’s proposal shall include vendor’s facilities established at the respective works, the process capability, process stabilization, QC Systems followed, experience list, etc. along with his own technical evaluation and shall be submitted to the Owner for approval prior to any procurement. Such vendor approval shall not relieve the Contractor from any obligation, duty or responsibility under the contract.

For components/equipment procured by the Contractors for the purpose of the Contract, after obtaining the written approval of the Owner, the Contractor’s purchase specifications and enquiries shall call for quality plans to be submitted by the suppliers along with their proposals. The quality plans called for from the vendors shall set out, during the various stages of manufacture, the quality practices and procedures followed by the vendor’s quality control organisation, the relevant reference documents/standards used, acceptance level, inspection of documentation raised etc.

Such quality plans of the successful vendors shall be finalized with the Owner and such approved Quality Plans shall form a part of the purchase order/contracts between the contractor and the vendor, within three weeks of the release of the purchase order/contract for such bought out items/components, a copy of the same without price details but together with the detailed purchase specifications, quality plans and delivery conditions shall be furnished to the Owner by the Contractor.

The purchase specifications for the major bought out items, list of which shall be drawn up by the Contractor and finalized with the Owner shall be furnished to the Owner for comments and subsequent approval before orders are placed.

Owner reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor’s or their sub-vendor’s quality management and control activities. The Contractor shall provide all necessary assistance to enable the Owner carry out such audit and surveillance.

The Contractor shall carry out an inspection and testing programme during manufacture in his works and that of his sub-contractor’s and at site to ensure the mechanical accuracy of components, compliance with drawings, conformance to functional and performance requirements, identity and acceptability of all materials parts and equipment. He shall carry out all tests/inspections required to establish that the items/equipments conform to requirements of the specifications and the relevant codes/standards specified in the specifications, in addition to carrying out tests as per the approved Quality Plan.

Quality audit/surveillance/approval of the results of the tests and inspection will not, however, prejudice the right of the Owner to reject the equipment if it does not comply with the specification when Installed or does not comply with the specification in service and the above shall in no way limit the liabilities and responsibilities of the Contractor in ensuring complete conformance of the materials/equipment supplied to the relevant specification standard, data sheet, drawings etc.

For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.

Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Owner/authorized representative.

**30.1.3 QUALITY ASSURANCE DOCUMENTS**

The Contractor shall be required to submit two sets of compact discs of the following Quality Assurance documents within three weeks after dispatch of the equipment:

* 1. The inspection plan with verification, inspection plan check points, verification sketches, if used and methods used to verify that the inspection and testing points in the inspection plan were performed satisfactorily.
  2. Factory tests results for testing required as per applicable codes and standard referred in the specification.
  3. Inspection reports duly signed by QA personnel of the Owner and Contractor for the agreed inspection hold points. During the course of inspection, the following will also be recorded:
     + - 1. When some important repair work is involved to make the job acceptable; and
         2. The repair work remains part of the accepted product quality.

iv) All the accepted deviations shall be included with complete technical details.

**31 TESTS**

31.1.4.1. If the Engineer instructs the Contractor to carryout a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect the test shall be Compensation Event.

**32. CORRECTION OF DEFECTS**

* 1. The Engineer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.
  2. Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Engineer’s notice.

**33. UNCORRECTED DEFECTS**

* 1. If the Contractor has not corrected a Defect within the time specified in the Engineer’s notice, the Engineer will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

# D .COST OF CONTROL

**34. BILL OF QUANTITIES**

* 1. The Bill of Quantities shall contain items for the construction, installation, testing, and commissioning work to be done by the Contractor.
  2. The Bill of Quantities is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item.

**35. CHANGES IN THE QUANTITES**

* 1. If the quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent provided the change exceeds 1% of initial Contract Price, the Engineer shall adjust the rate to allow for the change.
  2. The Engineer shall not adjust rates from changes in quantities if thereby the initial contract Price is exceeded by more than 15 per cent, except with the Prior approval of the Employer.
  3. If requested by the Engineer, the Contractor shall provide the Engineer with a detailed cost breakdown on any rate in the Bill of Quantities.

**36. VARIATIONS**

All variations shall be included in updated Programs produced by the Contractor.

**37. PAYMENT FOR VARIATIONS**

* 1. The Contractor shall provide the Engineer with a quotation for carrying out the Variation when requested to do so by the Engineer. The Engineer shall assess the quotation, which shall be given with seven days of the request or within any longer period stated by the Engineer and before the Variation is ordered.
  2. If the work in the Variation corresponds with an item description in the Bill of Quantities and if, in the opinion of the Engineer, the quantity of work above the limit stated in Sub Clause 35.1 or the timings of its execution do not cause the cost per unit of quantity the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of new rates for the relevant items of work.
  3. If the Contractor’s quotation is unreasonable, the Engineer may order the Variation and make a change to the Contract Price which shall be based on Engineer’s own forecast of the effects of the Variation on the Contractor’s costs.
  4. If the Engineer decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the variation shall be treated as Compensation Event.
  5. The Contractor shall not be entitled to additional payment for costs which could have been avoided by giving early warning.

**38. CASH FLOW FORECASTS**

When the Program is updated, the Contractor is to provide the Engineer with an updated cash flow forecast.

**39. PAYMENT CERTIFICATES**

The Contractor shall submit to the Engineer monthly statements of the estimated value of work completed less the cumulative amount certified previously.

* 1. The Engineer shall check the Contractor’s monthly statement within 14 days and certify the amount to be paid to the Contractor after taking into account any credit or debit for the month in question in respect of materials for the works in the relevant amounts and under conditions set forth in sub-clause 51(3) of the Contract Data (Secured Advance).
  2. The value of work executed shall be determined by the Engineer.
  3. The value of work executed shall comprise the value of the quantities of the items in the Bill of Quantities completed.
  4. The value of work executed shall include the valuation of Variations and Compensation Events.
  5. The Engineer may exclude any item certified in a previous certificates or reduce the proportion of any item previously certified in any certificate in the light of later information.

**40. PAYMENTS**

* 1. Payments shall be adjusted for deductions for advance payments, retention and other recoveries in terms of the contract and deduction at source of taxes as applicable under the law. The Employer shall pay the Contractor the amounts certified by the Engineer within 60 days of the date of each certificate.
  2. Items of the Works for which no rate or price has been entered it will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

1. **COMPENSATION EVENTS**
   1. The following are Compensation Events unless they are caused by the Contractor.
2. The Employer does not give access to a part of the Site by the Possession Date stated in the Contract Data.
3. The Employer modifies the schedule of other contractors in a way which effects the work of the contractor under the contract.
4. The Engineer orders a delay or does not issue drawings, specifications or instructions required for execution of works on time.
5. The Engineer instructs the Contractor to uncover or to carry out additional tests upon work which is then found to have no Defects.
6. The Engineer unreasonably does not approve for a subcontract to be let.
7. Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of Letter of Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.
8. The Engineer gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.
9. Other contractors, public authorities, utilities or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.
10. The advance payment is delayed.
11. The effect on the Contractor of any of the Employer’s Risks.
12. The Engineer unreasonably delays issuing a Certificate of Completion.
13. Other Compensation Events listed in the Contract Data or mentioned in the Contract.
    1. If a Compensation Event would cause additional cost or would prevent the work being completed before the intended Completion Date, the Contract Price shall be increased and / or the Intended Completion Date is extended. The Engineer shall decide whether and by how much the Contract Price shall be increased and whether any by how much the Intended Completion Date shall be extended.
    2. As soon as information demonstrating the effect of each Compensation Event upon the Contractor’s forecast has been provided by the Contractor, it is to be assessed by the Engineer and the Contract Price shall be adjusted accordingly. If the Contractor’s forecast is deemed unreasonable, the Engineer shall adjust the Contract Price based on Engineer’s own forecast. The engineer will assume that the Contractor will react competently and promptly to the event.
    3. The Contractor shall not be entitled to compensation to the extent that the Employer’s interests are adversely affected by the Contractor not having given early warning or not having cooperated with the Engineer.
14. **TAX**
    1. As per the TGSPDCL procedures(prevailing now) the GST of 18% on the total value of labour portion of ECV will be shared on works contract where material & labour can be bifurcated in the ratio of 50:50 between the service provider(the contractor / agency) and service recipient(TGSPDCL). The 50% GST as mentioned above is to be paid by the service provider and the same will be reimbursed by the TGSPDCL on submission of the original receipt clearly earmarking on the receipt that it has been paid for the particular work which has been executed by the service provider and claiming reimbursement.
    2. As per the TGSPDCL procedures(prevailing now) the GST of 40% of 18% of ECV i.e.7.2% on the total value of the ECV will be shared on works contractwhere material & labour can not be bifurcated . The 50% of GST i.e. 7.2% as mentioned above is to be paid by the service provider and the same will be reimbursed by the TGSPDCL on submission of the original receipt clearly earmarking on the receipt that it has been paid for the particular work which has been executed by the service provider and claiming reimbursement.
15. **CURRENCIES**

All payments shall be made in Indian Rupees

1. **RETENTION**

44.1 The Employer shall retain 6% from each payment due to the Contractor as stated in the Contract Data, Subject to a maximum of 5% of contract value.

* + 1. On Completion of the whole of the Works and on submitting all Operation and Maintenance Manuals, 50% of the total amount retained is returned to the Contractor and balance 50% after Defects Notice Period and the Employer has certified that all Defects notified by him to the Contractor before the end Defect Liability period have been corrected.
    2. On completion of the whole of the Works 50% of the total amount retained is paid to the Contractor

1. **LIQUIDATED DAMAGES**
   1. The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the Contract Data for each day that the Completion Date is later than the Intended Completion Date (for the whole of the works or milestone as stated in the contract Data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages does not affect the Contractor’s liabilities.
   2. If the Intended Completion Date is extended damages have been paid, the Engineer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the payment calculated from the date of payment to the date of repayment at the rates specified in Sub Clause 40.1
2. **SECURITIES**
   1. The Performance Security (including additional security for unbalanced bids) shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount form and by a bank or surety acceptable to the Employer, and denominated in Indian Rupees. The Performance security shall be valid until a date 28 days from the date of expiry of Defects Liability Period and the additional security for unbalanced bids shall be valid until a date 28 days from the date of issue of the certificate of completion.
3. **COST OF REPAIRS**
   1. Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of Defects Correction periods shall be remedied by the Contractor at the Contractor’s cost if the loss or damage arises from the Contractor’s acts or omissions.

**E. FINISHING THE CONTRACT**

**48. COMPLETION**

48.1 Work should be completed within 4 Months from the date of Handing over of site.

48.2 The Contractor shall request the Engineer to issue a Certificate of Completion of the Works and the Engineer will do so upon deciding that the work is completed.

|  |  |  |  |
| --- | --- | --- | --- |
| **Items No.** | **Period after date of commencement** | **Cumulative percentage of work to be completed (Based on contract amount)** | **Remarks** |
| 1 | At the end of 1 Month | 25% |  |
| 2 | At the end of 2 Month | 50% |  |
| 3 | At the end of 3 Month | 75% |  |
| 4 | At the end of 4 Month | 100% |  |

**49. TAKING OVER**

* 1. The Employer shall take over the Site and the Works within seven days of the Engineer issuing a certificate of Completion.

**50. FINAL ACCOUNT**

* 1. The Contractor shall supply to the Engineer a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Engineer shall issue a Defect Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the Contractor’s account if it is correct and complete. If it is not, the Engineer shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Engineer shall decide on the amount payable to the Contractor and issue a payment certificate, within 56 days of receiving the contractor’s revised account.

**51. OPERATING AND MAINTENANCE MANUALS**

* 1. If “as built” Drawings and / or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the Contract Data.
  2. If the Contractor does not supply the Drawings and / manuals by the dates stated in the Contract Data, or they do not receive the Engineer’s approval, the Engineer shall with hold the amount stated in the Contract Data from payments due to the Contractor.

**52. TERMINATION**

* 1. The Employer or the Contractor may terminate the contract if the other party causes a fundamentals breach of the Contract.
  2. Fundamental breaches of Contract include, but shall not be limited to the following:

1. The Contractor stops work for 28 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Engineer.
2. The Engineer instructs the Contractor to delay the progress of the Works and the instruction is not withdrawn within 28 days.
3. The Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation.
4. A payment certified by the Engineer is not paid by the Employer to the contractor within 120 days of the date of the Engineer’s certificate;
5. The Engineer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer.
6. The contractor does not maintain a security which is required.
7. The Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract data; and
8. If the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in the executing the Contract.

For the purpose of this paragraph: “Corrupt practice” means the offering, giving receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution. “Fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition”.

* 1. When either party to the Contract gives notices of a breach of contract to the Engineer for a cause other than those listed under Sub Clause 52.2 above, the Engineer shall decide whether the breach is fundamental or not.
  2. Notwithstanding the above, the Employer may terminate the Contract for convenience.
  3. If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible.

**53. PAYMENT UPON TERMINATION**

* 1. If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer shall issue a certificate for the value of the work done less advance payments received up to the date of the issue of the certificate, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor the differences shall be a debt payable to the Employer.
  2. If the Contract is terminated at the Employer’s convenience or because of a fundamental breach of Contract by the Employer, the Engineer shall issue a certificate for the value of the work done, the reasonable cost of removal of Equipment, repatriation of the Contractor’s personnel employed solely on the Works, and the Contractor’s costs of protecting and securing the Works and less advance payments received upto the date of the Certificate, less other recoveries due in terms of the contract and less taxes due to be deducted at source as per applicable law.

**54. PROPERTY**

All materials on the Site, Plant, Equipment, Temporary Works and Works are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor’s default.

**55. RELEASE FROM PERFORMANCE**

If the Contract is frustrated by the outbreak of war or by another event entirely outside the control of either the Employer or the Contractor the Engineer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made.

## SECTION – 3

**SPECIAL CONDITIONS OF CONTRACT**

S.NO. DESCRIPTION

1.1A RESPONSIBILITY FOR EXECUTION OF THE CONTRACT

1.1B NOTICES

2. WORKING HOURS

3. EXTRA SHIFTS AND OVER TIME WORK

4. ACCIDENTS

5. INSURNACE FOR MATERIALS SUPPLIED BY BOARD

5.1. INDEMNITIES

6. LICENSE

7. TRANSPORT ARRANGEMENT

8. MACHINERY TOOLS AND TACKLES

9. SAFETY PRECAUTIONS

10. FIRE PRECAUTIONS

11. WORKING AREA AND CLEANLINESS

12. SITE DISCIPLINE

13. SITE OFFICE AND SITE STORES

14. APPROVAL OF INSTALLATION BY GOVERNMENT             AUTHORITIES (CEIG)

15. MEASUREMENT OF WORK

16. INCOME TAX

17. TERMINATION OF CONTRACT FOR BOARDA CONVENIENCE

18. LABOUR

19. COMPLIANCE WITH LABOUR REGULATION

# SPECIAL CONDITIONS OF CONTRACT

**1. DESCRIPTION**

The Contractor shall, at all times during the continuance of the contract, comply full with all existing Acts, regulations and byelaws including all statutory amendments and reenactments of State or Central Government and other local authorities and any other enactments, notifications and acts that may be passed in future either by the State or the Central Government or local authority, including Indian workmen’s Compensation Act, 1923. Contract Labour (Regulation and Abolition) Act 1970, the Child Labour Prohibition and Regulation Act, 1986 an Equal Remuneration Act 1976, Factories Act, Minimum Wages Act 1948, Provident Fund Regulations, Employees Provident Fund Act 1952 EPF Act 1996 and related acts passed from time to time. Schemes made under the Same Act the Buildings and other construction workers (Regulation of Employment and condition of service) Act 1996, the Cess Act 1996 and also applicable Labour Regulations, Health and Sanitary Arrangement for Workmen, Insurance and other benefits and shall keep Employer indemnified in case any action is commenced by Competent authorities for contravention by the Contractor.

If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provision stipulated above on the part of the Contractor, the Engineer shall have the right to deduct from any moneys due to the Contractor, his amount of Performance Security or recover from the Contractor personally any sum required or estimated to be required for making good the loss or damage suffered by the employer, responsibility in connection with the employee of the contractor, who shall, in no case, be treated as the employee of the Employer at any point of time.

**1.1A RESPONSIBILITY FOR EXECUTION OF THE CONTRACT (CLAUSE 16 OF G.C.C.)**

The Contractor shall carry out the entire work according to sound engineering practices. The responsibility lies with the Contractor for the proper execution of the erection work according to existing laws and byelaws at the time of contract execution. The Contractor shall confirm in respects to the requirements of CEIG (Chief Electrical Inspector to Government of A.P.) as and when required by them. However, the Contractor shall have to follow the instructions of the Employer or his authorized representative in respect of the following:

* + 1. Progress report to be submitted from time to time
    2. Progress and completion of the work according to the time schedule
    3. Execution of contract work to the Purchaser’s entire satisfaction
    4. Submitting the details regarding the name of the responsible persons for execution of this contract.
    5. Preparing, submission and getting approval of the complete electrical system of the power plant including the switchyard, from the CEIG will be contractor’s responsibility.

**1.1B NOTICES:**

* + 1. All Certificates, notices or written orders to be given by the Employer to the Contractor under the terms of the contract shall be served by sending by post or delivering the same to the Contractor’s principal place of business, or such other address as the Contractor shall nominate for this purpose.
    2. All notices to be given to the TGSPDCL or to the Engineer under the terms of the Contract shall be served by sending by post or delivering the same to the respective address nominated for that purpose.

The TGSPDCL address is

**The Chief Engineer**

**Ranga ReddyZone, TGSPDCL,**

**KPHB Colony, Hyderabad – 72.**

The Engineer’s address is

Executive Engineer /Civil/RR Zone

incharge of works

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **WORK HOURS (CLAUSE 12 OF G.C.C.)**

Before commencement of work, the contractor shall inform in writing, the normal working hours for his staff workers. These1 hours be as far as possible in consonance with the Employer’s working hours for better coordination.

All the staff and workers should positively leave the site premises after these hours, except for authorized watch and ward personnel, approved by the employer.

1. **EXTRA SHIFTS & OVERTIME WORK (CLAUSE 12 OF G.C.C.)**

At the commencement of work, the Contractor shall arrange for a general shift, as per working hours.

If, at a later date the employer feels that extra shifts should be started to complete the work allotted to the Contractor within the time stipulated or to make up for any past delays. The contractor shall arrangement for.

1. **ACCIDENTS (CLAUSE 12 OF G.C.C.)**

The employer will not be responsible for any damages or compensation payable in consequence of an accident or injuries to any of the Contractor’s personnel or any third party.

The Contractor shall insure at his cost-against any such eventually as per rules in force and submit the documentary evidence of the Insurance Policy taken, positively prior to commencement of work at site and should keep policy valid by paying premium and other changes till handing over of the plant.

In case of any accidents at or near the site in connection with the execution of work, the contractor shall 24 hours, make a detailed report of the accident and submit the same to the purchaser in the form provided by the purchaser. The

contractor shall also report such accidents to the competent authority as laid down by the existing rules and regulations and inform the Employer regarding the same.

1. **INSURANCE FOR MATERIALS SUPPLIED BY BOARD (CLAUSE 13 OF G.C.C.)**

The Contractor shall insure in the name of the TGSPDCL for the amount equal to the value of material supplied to him by the TGSPDCL against loss or damage for the period from the time of taking over the materials from the TGSPDCL to the date of issue of completion certificate. The value of the policy shall be enhanced from time to time depending upon the value of the TGSPDCL materials taken over. NPDCL will reimburse the above insurance charges on submission of his claim together with insurance policy.

* 1. **INDEMNITIES :**
  2. The contractor is liable for and indemnifies the TGSPDCL against losses, expenses and claims for loss or damage to physical property, personal injury and death caused by his own acts or omissions.
  3. The contractor claiming indemnity to take all reasonable steps to mitigate the lower damage will occur
  4. The contractor indemnifies the TGSPDCL against claims to damages caused by the movement of his equipment or temporary works.
  5. The Contractor shall submit an “Indemnity Bond” to the TGSPDCL incorporating the above points before taking up the execution of the work.

1. **LICENCE (CLAUSE 16 OF G.C.C.)**

The contractor or his sub-contractor shall have valid contractor’s license from Electrical Inspector of A.P. State, and he shall maintain its validity for the complete duration of the contract.

1. **TRANSPORT ARRANGEMENT (CLAUSE 17 OF G.C.C.)**

The contractor shall make the transport arrangement at his cost for his staff and workers to site.

1. **MACHINERY, TOOLS & TACKLES (CLAUSE 17 OF G.C.C.)**

The Contractor shall provide the required machinery/equipment, accessories, necessary tools and tackles, instruments, and all the normal consumable materials required for the satisfactory execution of this contract. The Contractor shall arrange for cranes for unloading and erection purpose, if required.

GatePass for Materials:

All tools, tackles, construction materials, welding materials etc., will be taken inside the site limits only after registration with security personnel. Also any material will be taken out only on valid gate pass issued by Purchaser’s representative after checking the proper “IN” gate passes. The contractor shall have to preserve the “IN” gate passes obtained from security when every any material is route inside the site to enable taking back the balance/excess materials, Tools and Tackles after completion of Works.

**9. SAFETY PRECAUTIONS (CLAUSE 19 OF G.C.C.)**

All the safety measures to avoid accidents shall be followed strictly in accordance with the safety rules and regulation laid down by the government authorities.

The Contractor shall take all safety precautions and shall provide proper scaffolding, lifebelts, ladder shock proof helmets, etc. to avoid accidents and to ensure safety, of not only his personnel but also the safety of the staff and workers of other contractors working at the same site.

The contractor shall take necessary precautions to ensure that no part of the building/structure damage or disfigured due to negligence on his part while carrying out the work. In case of excess damage, the same shall be made good by the contractor immediately at his own cost. Recommissioning on energized equipment shall be carried out with proper safety permits issued by the Purchase/Competent authorities. When required to work at heights or at hazardous location areas, the contractor shall carry out the same with atmost care and all safety precautions.

**10. FIRE PRECAUTIONS (CLAUSE 19 OF G.C.C.)**

The contractor shall strictly instruct his site staff and workers to abide by the regulations sin force at the site regarding all precautions to be taken to avoid fir hazards.

**11. WORKING AREA & CLEANLINESS (CLAUSE 21 OF G.C.C.)**

The Contractor shall keep the site of work in a clean and sanitary condition. After the completion of the entire work, the contractor shall arrange to remove all the temporary structures, surplus materials, dirt, debris, etc. from the site and finished work shall be handed over the employer in a clean and complete shape.

**12. SITE DISCIPLINE (CLAUSE 21 OF G.C.C.)**

Strict discipline shall be observed by all contractor’s personnel inside the premises of the site. The contractor and his personnel shall abide by all the rules and regulations of the Employer, Disciplinary action shall be taken against the Contractor/his personnel and their services liable to be terminated, if found quarreling violating the rules.

**13. SITE OFFICE & STORES (CLAUSE 21 OF G.C.C.)**

The contractor will make necessary arrangements for erection of his site office and site stores after getting written permission from the employer to erect such temporary structure at his own cost. Temporary power supply will be provided at one point on chargeable basis at the nearest switch room and further cabling upto the contractor’s office or work is included in the Contractor’s scope. Every meter of adequate rating and associate equipment for construction power distribution is in the Contractor’s scope. The Contractor shall indicate construction power requirement in the Offer. The power consumption charges will have to be borne by the Contractor. However the non availability of the Crane does not leave the contractor off his responsibilities. The contractor is permitted to make use of water source available if any sub-station sites for construction purpose. Transport of water from the source to the working areas will be contractors responsibility.

**14. APPROVAL OF INSTALLATION BY GOVERNMENT AUTHORITIES (CEIG)**

Whenever approval of government authorities is requires, as per existing rules and regulations, the Contractor shall obtain the same.

**15. MEASUREMENT (CLAUSE 42 OF G.C.C.)**

The Engineer shall, except as otherwise stated ascertain and determine by measurement the value in terms of the contract of work done in accordance with the contract. He shall, when required any part or parts of the works to be measured, give notice to the contractor’s authority agent or representative, who shall forth with attend or send a qualified agent to assist the Engineer or the Engineer’s Representative in making such measurement, and shall furnish all particulars required by either of them. Should the contractor not attend or neglect or omit to send such agent, then the measurement made by the Engineer or approved by him shall be taken to be the correct measurement of the work. For the purpose of measuring such permanent work as is to be measured by records and drawings, the Engineer’s representative shall prepare records and drawings month by month of such work and the Contractor, as and when called upon to do so in writing, shall within fourteen days, attend to examine and agree such records and drawings with the Engineer’s Representative and shall sign the same when so agreed. If the Contractor does not so attend to examine and agree such records and drawings, they shall be taken to be correct. If, after examination of such records, and drawings, they shall be taken to be correct. If, after examination of such records and drawings the contractor does not agree the same or does not sign the as agreed, they shall nevertheless be taken to be correct, unless the contractor shall, within fourteen days of such examination, lodge with the Engineer’s Representative, for decision by the Engineer, notice in writing of the respects in which such records and drawings are claimed by him to be incorrect. Payments will be made to the contractor by cheque at monthly intervals. The contractor shall submit his bills for work accomplished and measured by Engineer on or before the last of month.

**16. INCOME TAX (CLAUSE 42 OF G.C.C.)**

a) Deductions will be made towards Income Tax at source by the TGSPDCL as directed by Income Tax Department.

b) The Contractor’s staff, personnel and labour will be liable to pay personnel income taxes in India in respect of such of their salaries and wages as are chargeable under the laws and regulations for the time being in force, and the contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws and regulations.

**17. TERMINATION OF CONTRACT FOR TGSPDCL CONVENIENCE (CLAUSE 52.4 OF G.C.C.)**

The TGSPDCL shall be entitled to terminate this contract any time for the TGSPDCL convenience after giving 30 days prior notice to the contractor with a copy to the Engineer.

**18. LABOUR :**

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements, for the engagements of all staff and labour, local, or other, and for their payment, housing, feeding and transport.

The Contractor shall, if required by the Engineer, deliver to the Engineer a return in detail, in such form and at such intervals as the Engineer may prescribe showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such information respecting Contractor’s Equipment as the Engineer may require.

**19. COMPLIANCE WITH LABOUR REGULATIONS:**

During continuance of the Contract. The Contractor and his sub contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, byelaws that may be passed or notification that may be issued under any labour law in future either but the State or the Central Government or the local authority. Salient features of some of the major labour laws that are applicable to construction industry are given below. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the Competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor, the Engineer/Employer shall have the right to deduct any money due to the contractor including his amount of performance security. The Employer/Engineer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

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

Salient features of some major labour laws applicable to establishments engaged in building and other construction work.

* + - 1. Workmen Compensation Act 1923:- The Act provides for compensation is case of injury by accident arising out of and during the course of employment.
      2. Payment of Gratuity Act 1972: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years service or more or on death the rate of 15 days wages for every completed year of service. The Act is applicable to all establishment employing 10 or more employees.
      3. Employees P.F. and Miscellaneous Provision Act 1952: The Act provides for monthly contributions by the employer plus workers @ 10% or 8.33 %. The benefits payable under the Act are:

1. Pension or family pension on retirement or death, as the case may be.
   * + - 1. Deposit linked insurance on the death in harness of the worker.
         2. Payment of P.F. accumulation on retirement/death etc.
       1. Maternity Benefit Act 1951: The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
       2. Contract labour (Regulation 7 Abolition) Act 1970: The Act provides for certain welfare measures to be provided by the Contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by Law. The Principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more contract labour.
       3. Minimum Wages Act 1948: The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.
       4. Payment of Wages Act 1936: It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
       5. Equal Remuneration Act 1979: The Act is provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.
       6. Payment of Bonus Act 1965: The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employee drawing Rs.3500/- per month or less. The bonus to be paid to employees getting Rs.2500/- per month or above upto Rs.3500/- per month shall be worked out by taking wages as Rs.2500/- per month only. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.
       7. Industrial Disputes Act 1947: The Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations or lock-out becomes illegal and what are the requirements of laying off or retrenching the employees or closing down the establishments.
       8. Industrial Employment (Standing Orders) Act 1946: It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority.
       9. Trade Unions Act 1926: The Act lays down the procedure for registration of trade unions of workmen and employees. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.
       10. Child Labour (Prohibition & Regulation) Act 1986: The Act prohibits employment of children below 14 of age in certain occupations and process and provides for regulations of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry.
       11. Inter-State Migrant workmen’s (Regulation of Employment & Conditions of Service) Act 1979: The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home upto the establishment and back, etc.
       12. The Building and Other Construction worker (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996: All the establishment who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.
       13. Factories Act 1948: The Act lays down the procedure for approval at plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

### SECTION 4

#### CONTRACT DATA

##### CONTRACT DATA

**Item marked “N/A” do not apply in this Contract.**

The following documents are also part of the Contract:

Clause

###### Reference

* + - * + The Schedule of Operating and Maintenance Manuals (51)
        + The Schedule of Other Contractors (8)
        + The Schedule of Key Personnel (9)

The Borrower TGSPDCL (1.1)

Loan given by PFC. (1.1)

The above insertions should correspond to the information provided in the Invitation of Bids.

The Employer is

Name And Address :

The Chief Engineer

Ranga ReddyZone, TGSPDCL,

KPHB Colony, Hyderabad – 72.

**Name of authorized Representative**: Executive Engineer/Civil/RR Zone

The Engineer is

**Name:** Assistant Executive Engineer/Civil/Cybercity.

**Address:** TGSPDCL/Hyderabad

The name and identification number of the Contract is Bid No.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Insert name and number as indicated in the Invitation for Bids (or Prequalification, if any) (1.1)

The Works consist of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Brief Summary, including relationship to other contracts under the Project)

The Start Date shall be Date of Handing over of site (1.1)

The Intended completion Date for the whole of

The Work should be completed with the following milestones: (17,28)

Milestone dates:

Physical works to be completed Period from date of issue of

Notice to proceed with the work

Milestone 1 i.e. 25% of quantum work 1 Month from the start date

Milestone 2 i.e. 50% of quantum work 2 Month from the start date

Milestone 3 i.e. 75% of quantum work 3 Month from the start date

Milestone 4 i.e. 100% of quantum work 4 Month from the start date

The following documents also part of the Contract: (2.3)

The Contractor shall submit a revised Program for the Works

Within 30 days of delivery of the Letter of Acceptance. (25)

The Site Possession Dates shall be : (21)

Section 1}

Section 2} Within a month after entering into Agreement

Section 3}

The Site is located at ………………… (1)

And is defined in drawings Nos…………….

The Defects Liability Period is 12 Months from the date of issue of completion certificate (32)

The minimum insurance cover for physical property, injury (41)

And death if Five (lakhs) per occurrence with the number of occurrences

Limited to four. After each occurrence, contractor will pay additional premium

Necessary to make insurance valid for four occurrences always.

The following events shall also be Compensation Events: (25)

1.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The period between program updates shall be 7 days. (25)

The amount to be withheld for late submission of an updated Program shall be Rs.25000/-

(27)

The language of the Contract documents in English (3)

The law which applies to the Contract is the law of India (3)

The currency of the Contract is Indian Rupees. (43)

Institution whose arbitration procedures shall be used: (24)

The proportion of payments retained (retention money) shall be 5% from each bill subject to a maximum of 5 % of contract value (44)

The liquidated damages for the whole of the works are at Rs.0.05% on the estimated cost per day (amount) per day and that for the milestone are as under:

The maximum amount of liquidated damages for the whole of the works is ten percent of final contract price. (45)

# SECTION 5

**TECHNICAL SPECIFICATIONS**

TECHNICAL SPECIFICATION

General :-

The Specification for various works should conform to the relevant clauses of the APSS and the special specifications included in the tender schedule. If there is any difference between the two, the later will be applicable. If for any item of work, detailed specifications are not indicated either in these technical specifications or in the APSS then, that work shall be carried out as per the relevant Indian Standard specifications (latest edition).

a. The scope of work includes **-** **Construction of SE/Assessments office Building, Near B-Block, Corporate Office, Mint Compound, Hyderabad**

.

**1. TENDER DRAWINGS:**

a) The following tender drawings for civil works are attached with the bid document to give the idea of nature of work to bidders.

b) Tender drawings attached are preliminary and meant for **bid purpose only**. **They shall not be considered as final drawings.**

**IS- STANDARD:**

The civil works shall be in general conform to the following standards: -

IS: 269 Specification for ordinary rapid hardening and low heat Portland cement.

IS: 383 Specification for coarse and fine aggregate from natural sources for concrete.

IS: 1199 Method of sampling and analysis of concrete.

IS: 3025 Method of sampling and test (physical and chemical water used in industry).

IS: 456 Code of practice for plain and reinforced concrete (latest revision).

IS: 432 Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement (part-I & II).

IS: 1139 Specification for hot rolled mild steel and medium tensile steel deformed bars for concrete reinforcement.

IS: 1566 Specification for plain and hard drawn steel wire fabricator concrete reinforcement.

IS: 1785 Specification for plain and hard drawn steel wire for pre-stressed concrete (part-II).

IS: 1786 Specification for cold twisted steel bars for concrete reinforcement.

IS: 2090 Specification for high tensile steel bars used in pre-stressed concrete.

IS: 4990 Specification for plywood for concrete shuttering work.

IS: 2645 Specification or integral cement water proofing compounds.

IS: 4461 Cold worked steel bars for the reinforcement of concrete.

IS: 2514 Specification for concrete vibrating tables.

IS: 802 Code of practice for the design and construction of transmission line towers

(part-I, II & III).

IS: 200 Method of measurement of building and civil engineering (part-I) work: part-I: Earthwork.

IS: 3764 Safety code for excavation work.

IS: 4701 Code of practice for earthwork on canals.

IS: 2502 Code of practice for bending and fixing of bars for concrete reinforcement.

IS: 1838 Performed fillers for expansion joints concrete non-extruding and resilient type (bitumen impregnated filler).

IS: 2386 Specific gravity, density, voids, absorption and (part-III) buckling.

IS: 2505 General requirements for concrete vibrators, immersion type. IS: 2506 Screen board concrete vibrators.

IS: 3370 Code of practice for concrete structures for the storage of liquids.

IS: 3350 Methods of tests for routine control for water used in industry. IS: 4456 Form vibrators for concrete.

IS: 9103 Admixtures for concrete.

IS: 517 Methods of test for strength of concrete.

IS: 4091 Code of practice for the design and construction of foundation for transmission lines.

IS: 1893 Code of practice for seismic loads and designs.

IS: 800 Code of practice for structural steel is building.

Note: The APSS is available on sale at government of A.P, printing press.

1.0 Levelling of Site: -

The site is to be levelled all-round the building area including removal of vegetation. The Ground also shall be lowered or raised to the required level if necessary with excavated earth or as directed by Engineer at site.

2.0 Excavation: -

Excavation shall include careful removal of all materials of whatever nature and whether dry or wet, necessary for the construction of work, and leveling site exactly in accordance with lines, levels, grades and curves shown in the plans or as directed by the Engineer-in-charge. It shall be taken to exact widths and levels of the lowest step of foundation /footing/floor and the sides shall be left to plumb where the nature of the soil permits. Any shoring, strutting and timbering or cutting of extra widths of trenches required for providing working space shall be done by the contractor and the same shall be deemed to have been included in the quoted rate. The contractor shall notify the Engineer-in-charge before starting excavation and take cross section levels (for purposes of measurements) jointly with the Engineer-in-charge before the Ground is disturbed. The bottom of the foundation shall be leveled both longitudinally and transversely stepped as directed, the contractor shall provide suitable arrangements to prevent surface water from any source entering the foundation pits at his own cost.

No blasting shall be permitted for excavation of foundations without prior permission of the Engineer-in-charge. The contractor shall not undertake any concreting in foundation until the excavation pit is approved by the Engineer-in-charge. The rate quoted for excavation shall include bailing or pumping of water which may accumulate in the excavation during the process of work either from seepage, rain or any other cause. The excavation shall be kept away from water. All materials excavated from the foundation of whatever kind they shall be placed at a distance of more than 1.5M from the edge of the foundation or as directed by the Engineer-in-charge. All excavated material shall remain the properties of the TGSPDCL. Material suitable for filling or other use shall be stacked in places as directed by Engineer-in-charge.

Surplus earth and soil which are not useful shall be removed and conveyed as directed by Engineer-in-charge.

The quoted rate shall include clearing of site, setting out and works required for excavation, cost of excavation, pumping and bailing out rain water/surface water accumulated in the excavated pit, stacking of excavated earth, shoring, removal and disposal of surplus excavated soil from the construction site if any, with initial leads and lifts, labour charges, including hire charges of machinery ,tools& plants ,insurance, all incidental charges etc. complete for finished item of work as directed by Engineer-in-charge.

**3 . ANTI-TERMITE TREATMENT :**

SCOPE: The scope of work is to set up a chemical barrier against attack by subterranean termites.

GENERAL: All work shall in general, be executed as specified in IS:6313 Part-II,IS:6333 Part II,IS:6433:1978,IS 2682:1984 and as per approved specification of the agency having special know-how for the job. All necessary work to ensure uniform distribution and proper penetration of treating solution shall be done according to the instruction of the Engineer-in-charge. Soil treatment shall not be done when it is raining or when the soil is wet with rain or subsoil water. Once formed, the treated soil barrier shall not be disturbed.

CHEMICALS AND RATE OF APPLICATION:

Any of the following chemicals (conforming to relevant Indian Standards) in water emulsion shall be applied by pressure pumps uniformly over the area treated:-

Chemicals Concentration by weight percent.

Dieldrin (IS:1052-1962) 0.5

Aldrin (IS:1306-1958) 0.5

Chlordane (IS:2863-1964) 1.0

Heptachlor 0.5

ACCEPTANCE CRITERIA: The contractor shall give a 1 year service guarantee in writing supplemented by a separate and unilateral guarantee from the specialised agency for the job to keep the building treated free of termites for the specified period at no extra cost to the purchaser.

I.S. CODE: Relevant code applicable for this specification: IS:6317(Part-II)-1971: Code of practice for Anti-termite Measures in buildings.

4.     FOUNDATIONS

     CC (1:4:8) using 40mm HBG metal shall be laid as leveling course under footings UG sump, storm water drain, septic tank. The CC work shall be executed as per specification numbers 402 of APSS.

The quoted rate shall include cost of all materials, all operations, labour charges, tools, tackles, machinery, curing, dewatering, water leads ,all leads and lifts and the incidental charges connected with the work etc. complete for finished item of work as directed by the Engineer-in-charge.

5.0 CRS Masonry for Foundations and Basement:-

The foundations and basement at stilt floor rooms and Retaining wall shall be constructed with CRS. masonry using hard broken granite stones in CM (1:6).

The quoted rate shall include cost of all materials, all operations, including dewatering if required, labour charges tools, tackles, machinery, curing, water leads, all leads and lifts and other incidental charges connected with the work etc. complete for finished item of work and as directed by the Engineer-in-charge.

a) SCOPE : The contractor shall furnish all labour, materials and equipment required for the construction of all stone masonry work required as mentioned in this section as per drawings and specifications.

b) MATERIALS : Stones shall be obtained from the quarries to be approved by the engineer and shall conform to IS:1597 (Part-I). Stones shall be of uniform colour and texture, hard, durable, tough, and the best quality of its respective kind. These shall be free from decay, sand holes, veins, flaws cracks and other defects. These shall be carried to such a way as to be most suitable for one particular class of work for which these are required. Stone not suited for the particular class of work removed from the site be the contractor.

c) LAYING :

The stones shall be laid on their broadest face.

         Stratified stones shall be laid on their natural bed i.e., with the strata perpendicular to the pressure. The course shall be built perpendicular to the pressure. Where there is to be variation in the depth of courses, larger stones are to be placed in the lower courses, the thickness of courses decreasing gradually towards the top of the wall. To give sufficient lateral bond, a stone in any course should overlap the stone in the course below, ie., joints parallel to the pressure in two adjoining courses should not lie too closely in the same vertical line To give sufficient transverse bond, the prescribed number of headers must extend from front to back of thin walls or from outside to the interior of thick walls.At all angle junctions of walls, the stones at each alternative course shall be so carried into each of the respective walls as to unite the work thoroughly.Where breaks are unavoidable in carrying up the continuously in horizontal courses, sufficient long steps shall be left to join the old and new work.If it is necessary to move a stone after it has been placed on the mortar bed, it should be lifted clear and rest and not made to slide over stones already laid.

d) **WATERING :**

To prevent absorption of water from the mortar, the stones shall be sufficiently well wetted before laying. All masonry shall be kept watered for three weeks from the date of building in place unless otherwise instructed by the engineer. At the close of the day's work or for other period of cessation of the work, the top of all unfinished masonry is to be kept well flooded. Should the mortar perish ie., become dry, white or powder through neglect of watering the work shall be pulled and rebuilt at the contractor's expense. All masonry shall be washed down on completion of all stains. Mortar and Materials to Conform to Standard Specification : The mortar to be used for each class of masonry shall conform to the particular standard specification for that class of mortar and the standard specification for the materials used.

No deductions shall be made for pipe openings each up to 0.1 Sqms in area or for fixtures up to 0.05 Sqm in area.

6.0 Refilling the foundations & basement :

Refilling the foundations & basement is to be done with usefull available sand/excavated soils and as directed by the Engineer-in-charge.

Filling shall be done after the concrete or masonry in the foundation has fully set and its curing is completed. It shall be done in such a manner as not to cause undue thrust/impact on any part of the structure.

Back filling around completed foundations shall be done to the required lines and levels/depths including any trimming of surfaces as may be necessary. This will be done with selected and approved excavated usefull soil as directed by Engineer-in-charge. The refilling shall be done in horizontal layers of thickness not exceeding 15cm, free from pockets with careful watering, ramming and rolling etc. to obtain necessary level of compaction.

The contractor shall not fill in and around any work until it has been approved by Engineer-in-charge.

The quoted rate shall include cost of excavated usefull soil, carrying up to directed locations, placing, watering, compacting in layers, trimming and dressing to finished surface and disposal of surplus material if any.

7.0 Brick Masonry:

The superstructure of the building shall be constructed in all thickness with brick masonry in CM (1:6) using second class bricks of approved quality from approved source having minimum crushing strength of 40Kg/cm2. and water absorption not exceeding 20 % by weight.

a) **Scope :**

The contractor shall furnish all labour, materials and equipment required for the construction for all brick masonry work as shown in the construction drawings.

b) **Bricks :**

Light weight bricks conforming to IS code shall be of uniform colour, strength and size with minimum crushing strength of kg/ sq.cm. The bricks shall have smooth surfaces with corners straight; they shall not be twisted or chipped; when broken they shall reveal a fine, uniform, non‑vitreous grain; they shall emit ringing sound when tapped with a hammer; they shall absorb water on immersion (not more than one‑sixth of its original weight after soaking for 15 minutes) and dry sufficiently quickly. The bricks shall not show any sign of efflorescence after soaking and drying in shade. If the bricks show any sort of efflorescence the contractor shall do the necessary treatment at his own cost to the satisfaction of the engineer.

All bricks shall be subjected to inspection and approval and representative samples shall be submitted before ordering out. Contractor shall submit sample of bricks and arrange to test these bricks in approved laboratory and submit the test results for approval prior to commencement of work .

c) **Mortar :**

Mortar shall be prepared with the materials as specified in this specification and the mortar shall conform to IS:2250. The type of mortar to be used shall be in proportion specified in Schedule ‑'A'.

d) **Brick Works :**

**Soaking of Bricks :**

Bricks required for masonry in cement mortar shall be wetted to saturation point by prolonged immersion, but never by spraying. The cessation of bubbles, when the bricks are immersed in water, shall be an indication of thorough soaking of bricks. The soaked bricks shall be kept on wooden plank to avoid earth being smeared on them.

e) **Laying :**

Brick work shall be laid with best skill and the greatest care and diligence. Each brick shall be pressed on the layer of the specified mortar so that this spreads all around it and fill the joints which shall never be more than 10 mm nor less than 5 mm wide. Mortar ingredients shall be of proper grain size to permit joints within these limits.

The whole of the brick work shall be built in English bond unless otherwise directed. No four brick courses shall rise more than 25 mm over above the same laid dry. No brick bats shall be used excess where required as closures The bricks shall be thoroughly bedded on cement mortar during each layer. After every third course reinforcing steel consisting of 2Nos. of 6mm dia mild steel bars shall be provided and these shall be anchored to the structural steel as directed by the Engineer. However, the reinforcement steel shall be separately paid for at their quoted rates for reinforcement.

The work will be done in a proper manner in the first instance only and no grouting shall be resorted to. String courses, cornices and mouldings shall not generally be provided unless as shown on the drawings or as directed by the engineer. The architectural features and treatment if required as per the drawings or as may be finalised before execution and such items whether in large or small quantities and any shape and size, shall have to be provided by the contractor at the rates in relevant items of the bill of quantities. The contractor shall not be eligible to claim any extra rate on this account. The brick work must be laid true to line and level with horizontal courses and vertical perpendicular faces and corners etc.

f) **Non‑Bearing Walls :**

Non‑bearing walls (dividing walls) shall be built of choice bricks, for both header and stretcher courses. No broken bricks or bricks with chipped corners will be accepted.

g) **Curing :**

Green work shall be protected from rain by suitable covering. Brick work in cement mortar shall be kept constantly moist on all the faces for a minimum period of ten (10) days. The top of masonry work shall be left flooded at the close of the day.

h) **Measurements :**

Masonry work in general shall be geometrically measured by volume . The volume of the walls shall be reduced for all voids, hollows, recess and openings of net area more than half a square meter, without accounting for flares, that is discounting only the volume obtained multiplying the net span of the opening in rough by thickness of the wall the depth of the recess, assuming that the volume of flares and splays shall cover the higher skill required in their construction. The provision, during construction of recess and holes for passage of pipes as designed and previously arranged and ordered, shall not entitle the contractor to any compensation. The plinth level shall be taken as 0.00 level of the respective building. The unit rate shall include supply of materials, transport, mortar of required proportion and curing.

All the measurements are to be done as per IS:1200 (relevant parts) for the items not covered above.

Contractor shall submit sample of bricks and arrange to test these bricks in approved laboratory and submit the test results for approval prior to commencement of work .

Bricks required for masonry in cement mortar shall be thoroughly soaked in clean water before use for at least six hours and until air bubbles ceases to come out. The soaked bricks shall be kept on wooden plank or brick platform to avoid earth being smeared on them.

Only skilled and experienced masons shall be employed for laying the brick masonry. Brick work shall be laid in English bond unless other wise specified. Half or cut bricks shall not be used except as closures when needed to complete the bond. Each course shall be perfectly straight horizontally and transversely. The walls shall be taken up truly plumb. The level of the brickwork in vertical walls shall be checked up every one meter interval.

All iron fixtures, pipes, conduits, drain sleeves, bolts, hold fasts of doors and windows etc. which are required to be built in wall shall be embedded in cement mortar or in cement concrete as specified, in their correct position, as the work proceeds.

Brick masonry shall be in CM(1:4 ) for partitions in rooms.

The quoted rate shall include the supply of all materials, including conveyance seignorage charges labour, tools, tackle, plant and equipment, scaffolding, shuttering, pocking the concrete and temporary works, curing with all leads and lifts and all other incidental charges required to complete the work in accordance with the standard specification. No deductions shall be made for openings less than 0.1 sq.m in area and for fixtures up to 0.05 sq. m in area.

i) **Applicable Codes and Specifications :**

The following codes, standards and specifications are made a part of this specification, All standards, tentative specifications, specifications, codes of practice referred to herein shall be the latest edition including all applicable official amendments and revisions.

In case of discrepancy between this specification and those referred to herein, this specification shall govern.

IS : 1077 : Common burnt clay building bricks

IS : 3102 : Classification of burnt clay bricks

IS : 2180 : Burnt clay building bricks ‑ heavy duty

IS : 3495 : Method of sampling and testing clay building bricks

IS : 2691 : Burnt clay facing bricks

IS : 2212 : Code of practice for brick work

**8.** **PLAIN AND REINFORCED CEMENT CONCRETE WORKS :**

8.1  **Scope** :This section of the specification covers the technical requirements for forming, placing and finishing of concrete, plain and reinforced cement concrete for all structures and their foundations at all levels and elevations e.g. buildings, walls, cable tunnels, cable ducts, foundations and footings, pits, posts, drains, water tanks as per approved drawings, manholes, etc., as required to complete the job as per the approved drawings. All concrete works as indicated in the scope of this contract shall be carried out as per these specifications.

a) This specification shall also apply to the extent it has been referred to or applicable with the special requirements of structures covered in scope of IS: 456. IS: 456 shall form a part of these specifications and shall be complied with unless permitted otherwise. For any particular aspect not covered by these code, appropriate IS code, specifications and/or replacement by any International Code of practice as may be specified by the Engineer shall be followed. All codes and Standards shall conform to its latest revisions.

b) Nominal Mix and Design mix :

1:2:4 ;1:3:6 and 1:4:8 shall be of Nominal Mix , M20 and above shall be of Design Mix. The mix proportions for all grades of concrete shall be designed to obtain strengths for respective grades of concrete. Preliminary tests as specified in the IS: 456 and required by the purchaser, shall be carried out sufficiently ahead of the actual commencement of the work with different grades of concrete made from representative samples of aggregates and cement expected to be used on the job to ascertain the ratios by weight of cement to total quantities of fine and coarse aggregate and the water cement ratio required to produce a concrete of specified strength and desired workability.

The contractor at his cost at an approved testing laboratory shall carry out the mix designs.

Whenever the sources of fine and course aggregates and/or brand of cement is changed, the tests shall again be carried out on the materials for ascertaining their suitability and the Mix Design shall also be carried out and this mix shall be used subject to the approval of the Executive Engineer.

The cement @ 350Kg. per 1 Cum of M20 grade concrete is considered for the estimate of this work. Tenderers are required to quote their rates keeping in view of the cement quantity as above. However, the actual utilization of cement will be as per the design mix. Excess/Less usage than the provision of 350Kgs. will be either reimbursed or recovered @ Rs. /- per M.T irrespective of other ingredients.

**8.2 GENERAL REQUIREMENTS**:

8.2.1 WORK TO BE PROVIDED BY THE CONTRACTOR**:**

The work to be provided for by the Contractor, unless otherwise specified shall include but not be limited to the following:

* 1. Furnish all labour, supervision, services including facilities as may be required under statutory labour regulations, materials, forms, templates, supports, scaffolds, approaches, aids, construction equipment, tools and plants, transportations, etc. required for the completion of work as per approved drawings.
  2. Except where it is excluded from the Scope of Contract, Contractor shall prepare progressively and submit for approval detailed drawings and Bar Bending Schedules for reinforcement bars showing the positions and details of spacers, supports, chairs, hangers etc.
  3. Design and prepare working drawings of formworks, scaffolds, supports, etc. and submit for approval.
  4. Submit for approval shop drawings for various inserts, anchors, anchor bolts, pipe sleeves, embedment, hangers, openings, frames etc.
  5. Submit for approval detailed drawings of supports, templates, hangers, etc. required for installation of various embedment like inserts, anchor bolts, pipe sleeves, frames, joint seals, frames, openings etc.
  6. Submit for approval detailed schemes of all operations required for executing the work, e.g. Material handling, Concrete mixing, placement of concrete, compaction, curing, services, approaches, etc.
  7. Design and submit for approval concrete mix designs required to be adopted on the job.
  8. Furnish samples and submit for approval results of tests of various properties of the following:

i) The various ingredients of concrete

ii) Concrete

iii) Embedment

iv) Joint seals

* 1. Provide all incidental items not shown or specified in particular but reasonably implied or necessary for successful completion of the work in accordance with the drawings, specifications and schedule of items.
  2. For supply of certain materials normally manufactured by specialist firms, the contractor may have to produce, if directed by the Engineer, a guarantee in approved proforma for satisfactory performance for one year as may be specified, binding both the manufacturers and the contractor, jointly and severally.

1. SAMPLES:

Samples of the following materials and any other materials proposed to be used, shall be submitted as directed by the Engineer, in sufficient quantities free of cost, for approval. Approved samples will be preserved by the Engineer for future reference. The approval of the Engineer shall not, in any way, relieve the contractor of his responsibility of supplying materials of specified qualities:

i) Coarse and fine aggregates.

ii) Admixtures.

iii) Plywood for formwork.

1. DESIGN MIX:

Design mix as per Clauses 11.2.1 (g) of this specification giving proportions of the ingredients, sources of aggregates and cement, along with accompanying test results of trial mixes as per relevant I.S., is to be submitted to the Engineer for his approval before it can be used on the works.

1. **Detailed Drawings and Bar Bending Schedules:**

**Detailed working drawings and Bar Bending Schedules in accordance with this specification.**

1. Inspection Reports: Inspection Reports in respect of formwork and reinforcement and any other item of work as may be desired by the Engineer in accordance with Clause 11.2.4 of this specification.
2. Test Reports: Reports of tests of various materials and concrete as required under Clause 21.0 SAMPLING & TESTING of this specification.
3. Any other data that may be required as per this specification.
   * 1. **MATERIALS :**

a) **Cement :**

Cement shall conform to IS: 269. The contractor shall be fully satisfied with the quality and properties of cement used irrespective of its source and/or supply.

b) **Admixtures :**

All concrete shall be designed for normal rate of setting and hardening at normal temperature. Variations in temperature and humidity under different climatic conditions will affect the rate of setting and hardening, which will, in turn, affect the workability and quality of the concrete. Admixtures may be permitted to be used in accordance with IS:456 to modify the rate of hardening , to improve workability or as an aid to control concrete quality.

The Executive Engineer shall have the authority at any time, and from time to time to order the addition of any air entering agent or other admixtures, to any mix of concrete in such proportionate quantity or mode, as he may specify and the contractor shall comply with the same without any extra cost.

c) **Aggregates :**

All the aggregates shall conform to IS:383. The natural aggregates shall be chemically inert, strong, hard, durable, of limited porosity, free from adherent coatings, clay lumps, coal and coal residues and shall contain no organic or other admixtures that may cause corrosion of reinforcement or impair the strength or durability of concrete. The limits of the content of deleterious materials in aggregate are indicated below.

Limits of the content of Deleterious Materials

(percent by weight of aggregate)

Deleterious Fine aggregates Coarse aggregates

Substances ‑‑‑‑‑‑‑‑-------‑‑‑‑‑‑‑---- -------‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑-----

Crushed Uncrushed Crushed Uncrushed

Coal & lignite 1.00 1.00 1.00 1.00

Clay lumps 1.00 1.00 1.00 1.00

Soft fragments ‑ ‑ 3.00 ‑

Material passing 3.00 3.00 3.00 3.00

75 micron IS sieve

Shale 1.00 ‑ ‑ ‑

Approved natural sand and crushed stone for structural concrete and well washed, thoroughly cleaned and graded natural gravel, for lean and backfill cement concrete shall be used as aggregate. Representative samples of selected aggregates shall be tested at the contractor's cost for sieve analysis from time to time as required by the engineer for approval.

i) **Fine Aggregates :**

Fine aggregate (sand) shall be clean, sharp, coarse sand with a fineness modules between 2.2 and 3.2 (fineness modulus is the sum of cumulative percentages retained on the IS sieves given below for gradation divided by 100). The contractor shall check and ensure that local sand will satisfy this requirement and if necessary shall include for and supply materials from other sources which comply with the specifications, it shall be graded as follows.

IS sieve P e r c e n t a g e p a s s i n g f o r

designation Grading Grading Grading

Zone ‑I Zone ‑ II Zone ‑III

10 mm 100 100 100

4.75 mm 90‑100 90‑100 90‑100

2.36 mm 60‑95 75‑100 85‑100

IS sieve P e r c e n t a g e p a s s i n g f o r

designation Grading Grading Grading

Zone ‑I Zone ‑ II Zone ‑III

1.18 mm 30‑70 55‑90 75‑100

600 microns 15‑34 35‑59 60‑79

300 microns 5‑20 8‑30 12‑40

150 microns 0‑10 0‑10 0‑10

The objectionable foreign matter in sand shall be removed by screening or washing or both as required.

ii) **Coarse Aggregate :** The coarse aggregate (crushed stone) shall conform to the following grading limits.

**Grading Limits :**

IS sieve Percentage retained for grade aggregate

designation 40 mm 20 mm 17 mm 12.5 mm

80 mm ‑ ‑ ‑ ‑

40 mm 0‑5 0 0 0

20 mm 30‑70 0‑5 0 0

17 mm ‑ ‑ 0‑10 ‑

12.5 mm ‑ ‑ ‑ 0‑10

10 mm 65‑90 45‑75 30‑70 15‑60

4.75 mm 95‑100 90‑100 90‑100 90‑100

The pieces shall be angular in shape and shall have granular or crystalline surfaces. Friable, flaky and laminated pieces, mica and shale, if present, shall be only in such quantities that will not, in the opinion of engineer, affect adversely the strength and durability of concrete. The maximum size of the aggregate shall be as specified in the drawings/specifications. The maximum size of coarse aggregate

shall be the maximum size specified, but in no case greater than 1/4 of the minimum thickness of the member provided that the concrete can be placed without difficulty so as to surround all reinforcement throughout and fill the corners of the form. For heavily reinforced concrete members, the nominal maximum size of the aggregate shall be 5 mm less than the minimum clear distance between the reinforcing main bars or 5 mm less than the minimum cover to the reinforcement whichever is smaller.

**Crushing Value** :

The aggregate crushing value, when determined in accordance with IS:2386 (Part IV) shall not exceed forty five (45) percent for aggregate used for concrete other than for wearing surfaces and thirty (30) percent for concrete for wearing surfaces, such as roads, pavements and floor finishes.

**Impact Value** :

As an alternative the aggregate impact value may be determined in accordance with the methods specified in IS:2386 (Part IV). The impact value shall not exceed forty five (45) percent by weight for aggregate used for concrete other than for wearing surfaces and thirty (30) percent by weight for concrete for wearing surfaces, such as roads, pavements and floor finishes.

**Abrasion Value** :

Unless otherwise agreed to between the purchaser and the supplier, the abrasion value of aggregates, when tested in accordance with the method specified in IS:2386 (Part IV), using Los Angeles Machine, shall not exceed the following values :

A. For aggregates to be used in Thirty (30)

concrete for wearing surfaces percent

B. For aggregate to be used in Fifty (50)

other concrete (structural) percent

The amount of fine particles occurring in the free state or as loose adherents shall not exceed 1% when determined by laboratory sedimentation tests as per IS:2386. After 24 hours immersion in water, a previously dried sample shall not have gained more than 10% of its even dry weight in air, as determined by IS:2386. Should at any time the engineer have reason to consider any aggregate defective or of poor quality, then irrespective of any previous approval or tests, representative samples of such materials shall be immediately tested and until the results of such tests prove the material to be satisfactory, it shall not be used for any work. The contractor shall not be entitled to any claim of any nature on this account. The cost of these tests (including collection of samples and transportation) shall be borne by the contractor.

d) **Reinforcing Steel :**

Reinforcement shall consist of any of the following types but shall conform to requirements shown on the drawings and should be corrossion resistant.

‑ Plain mild steel bars, Grade I (IS:432 Part I & IS:226)

‑ Cold twisted or deformed bars (IS:1786) Grade Fe 415

‑ Mild steel and medium tensile steel deformed bars(IS:1139)

‑ Medium tensile steel bars (IS:432 Part I & IS:961)

- Hard drawn steel wire mesh, fabric (IS:1566 & IS:432 Part II)

- Structural steel sections and plates shall conform IS : 226 and IS : 2062.

i) All steel shall be of grade I quality unless specifically permitted by the engineer. No rerolled scrap steel bars, pitted or otherwise defective bars shall be used. The contractor shall check and ensure that appropriate reinforcement bars are used for the work. **Otherwise necessary tests shall be made by the contractor at his own cost to ensure that quality and physical properties of materials used, conform to the specifications.**  No complaints or claims shall be entertained on this account.

ii) All reinforcing materials, before their final use shall be free from loose mill scale, rust, dust, oily or bituminous coating or any other injurious adherents.

iii) Pitted and otherwise defective bars and rerolled scrap steel bars shall not be used.

The contractor shall procure in time as necessary and check measure the reinforcing materials required for the continuous scheduled progress of work till the completion.

v) The reinforcement shall not be placed in direct contact with the Ground but stacked on timber sleepers or such similar arrangement. The reinforcement shall be coated with cement slurry before stacking to prevent scale and rust. Fabricated reinforcement shall be carefully stored to prevent damage, distortion, corrosion and deterioration.

v) Welding may be permitted with the written approval of the engineer, provided the carbon content of steel used is less than 0.3 per cent. Welding so permitted shall be in accordance with IS:317. Tack welding of reinforcement bars as shown in drawings may be necessary. Substitution of different size bars will be permitted only when authorised by the engineer.

vi) No part of the reinforcement, irrespective of whether the concrete work is under construction or completed, shall be used for conducting electrical currents. Electrical Grounding connections shall be carefully isolated from reinforcement.

vii) The number and size of all steel bars, ties, stirrups and other members of the reinforcement shall be in exact accordance with the drawings and the rods shall be bent cold by the gradual and uniform application of force to the shapes and dimensions given in the bar bending schedule supplied by the engineer. These schedules shall conform to IS:1566.

Viii) Bars which have been bent wrongly shall not be straightened, rebent and used without the permission of the engineer.

ix) Reinforcement shall be suitably supported by steel or concrete spacers, care being taken during the concreting operation to maintain the concrete cover specified. All hooks links and stirrups shall be such that the bars when tied together are properly braced. If possible, the reinforcement shall be fabricated with frames or mats before being fixed in the forms. Good quality ductile binding wire of 18 gauge shall be used to fix and secure the reinforcement so that no bars will be disturbed or displaced when the concrete is placed.Alternatively welding may be carried out to secure and fix the reinforcement instead of binding wire. No concreting shall be commenced until the bars have been properly fixed and tied at their specified location and have been inspected and approved by the engineer.

8.3 **Water :**

Water for all work shall be fresh, clean and free from injurious or deleterious materials and conforming to IS:3025. The contractor shall provide at his own cost for distribution, storage, filtration and / or treatment, as necessary of the required quality of water. Quality of water to be used in concrete shall be such as to obtain the consistency specified. This quality of water shall be subject to approval by the engineer on the basis of test finding and shall in no case be changed without permission. The suitability of water for making concrete shall be ascertained by the compressive strength and initial setting time test specified in IS:456.

8..4. **Gauging Water :**

The general arrangements for the supply of water for mixing concrete shall be to the satisfaction of the engineer who will determine the quantity of water to be used to the mix according to the degree of moisture in the aggregate. The quantity of water thus determined shall be accurately measured for each separate mixing in a suitable container.

8.5 Work test shall be performed according to the following schedule :

**Six (6) cubes of 15 cm sides for every 150 cum of concrete or for a shift of eight hours of concreting, of which three** (3) shall be tested at **seven (7)** days and three (3) at twenty eight (28) days. Concrete shall be considered unsatisfactory if the average strength of three ‑ 28 days cubes is below the value. However, only one of the three consecutive tests may give a value less than the specified strength but this shall not be less than 90% of the specified strength.

Samples shall be taken while concrete is being poured in the presence of representatives appointed by the engineer and the contractor. Proper record of work test shall be maintained and signed jointly. The preliminary test and works tests shall be at the contractor's expense.

Unless otherwise specified, the contractor shall provide all sand, coarse aggregate, cement and concrete required for testing and all handling, transport and all other services entitled in supplying the samples to the testing laboratory . The cost of the supply of materials and facilities shall be deemed to be included in the quoted rates.

8.6 **Consistency and Workability of the Concrete :**

8.6.1 Consistency and workability of concrete shall be checked by measuring the slump of a truncated cone of concrete straight from the mixer under normal working conditions. The conical mould shall be of metal, 300 mm high ‑ 100 mm & 200 mm in diameter at the top and base respectively.

8.6.2 **Moulds shall be prepared by the contractor**.

To maintain the consistency of concrete, slump test as per IS-1199 shall be carried out at contractor’s cost every two hours during work progress or at intervals established by the Engineer, in addition to the slump test to be carried out while making cubes. The table below gives the general slump range to be followed for various types of construction unless otherwise shown in drawings or instructed by the engineer.

Various types of construction Slump mm

Max. Min.

Reinforced walls and footings 80 30

Plain footings, caissons and 75 25

substructure walls

Slabs, beams and reinforced walls 100 25

Various types of construction Slump mm

Max. Min.

Pumps and other misc.equipment foundations 75 25

Building columns 100 25

Pavements 50 25

Heavy mass construction 50 25

The workability test by means of compaction factor tests as per IS:1199 shall also be carried out by the contractor at his cost.

8.7 **Optional Tests :**

The engineer, if he so desires, may order tests to be carried out on cement, sand, coarse aggregate, water in accordance with the relevant Indian Standards.

Tests on cement shall include

(i) fineness test

(ii) test for normal consistency

(iii) test for setting time

(iv) test for soundness

(v) test for tensile strength

(vi) test for compressive strength

(vii) test for heat of hydration (by experiment and by calculations) in accordance with IS:269.

Tests on sand shall include

(i) sieve test

(ii) test for organic impurities

(iii) decantation test for determining clay and silt content

(iv) specific gravity test

(v) test for unit weight and bulkage factor

(vi) test for sieve analysis and fineness modulus

Tests on coarse aggregate shall include

(i) sieve analysis

(ii) specific gravity and unit weight of dry, loose and rodded aggregate

(iii) soundness and alkali aggregate reactivity

(iv) petrographic examination

(v) deleterious materials and organic impurities

(vi) test for aggregate crushing value.

Any or all these tests would normally be ordered to be carried out only if the engineer feels the materials are not in accordance to the specification or if the specified concrete strengths are not obtained and shall be performed by the contractor at an approved testing laboratory at his cost.

If the work cubes do not give the stipulated strengths the engineer reserves the right to ask contractor to dismantle such portions of the work which in his opinion are unacceptable and redo the work to standard stipulated at contractor's cost. The contract price for concrete shall be all inclusive, including making preliminary mix design and test cubes, works cubes, testing them as per specification, slump tests, optional tests etc., complete.

8.8 STORAGE:

a) GENERAL **:** All materials shall be so stored as to prevent deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work. Any material, which has deteriorated or has been damaged or is otherwise considered defective by the Engineer, shall not be used for concrete and shall be removed from site immediately, failing which, the Engineer shall be at liberty to get the materials removed and the cost incurred thereof shall be realized from the contractor's dues. The Contractor shall maintain up to‑date accounts of receipt, issue and balance (stack wise) of all materials. Storage of materials shall conform to IS: 4082. General storage shall be carried out by the contractor in a manner affording convenient access for identification and inspection at all time. The storage facilities shall be subject to approval of the Engineer‑in‑charge.

b) CEMENT:Sufficient space for storage, with open passages between stacks, shall be arranged by the Contractor to the satisfaction of the Engineer. Cement shall be stored off the Ground in dry, weather proof, leak proof, well‑ventilated ware‑houses at the works in such a manner as to prevent deterioration due to moisture or intrusion of foreign matter.Cement shall be stored in easily countable stacks with consignment identification marks. Consignments shall be used in the order of their receipts at site. Sub‑standard or partly set cement shall not be used and shall be removed from the site, with the knowledge of the Engineer, as soon as it is detected. Cement hold in storage for a period of 90 days or longer shall be tested at an approved laboratory before being put to use.

c) AGGREGATES : Aggregates shall be stored by the contractor in areas floored with tightly laid wooden planks or other approved hard, smooth and clean surface, in a manner precluding intrusion or foreign material. Each size shall be kept separated with wooden or steel or concrete or masonry bulk‑heads or in separate stacks and sufficient care shall be taken to prevent the material at the edges of the stockpiles from getting intermixed. Stacks of fine and coarse aggregates shall be kept sufficiently apart with proper arranSSgement of drainage. The aggregates shall be stored in easily measurable stacks of suitable depths as may be directed by the Engineer.

d) REINFORCEMENT: Reinforcing steel shall be stored consignment‑wise and size wise off the Ground and under cover, in a manner to prevent object ional changes in original surface characteristics. It shall be protected from rusting, oil, grease and distortions. If necessary, the reinforcing steel may be coated with cement wash before stacking to prevent scale and rust at no extra cost to the purchaser. The stacks shall be easily measurable. Steel needed for immediate use shall only be removed from storage. Reinforcement shall be stored in separate piles or racks above grade.

8.9 QUALITY CONTROL:

Contractor shall establish and maintain quality control for different items of work and materials as may be directed by the Engineer to assure compliance with contract requirements and maintain and submit to the Engineer records of the same. The quality control operation shall include but not be limited to the following items of work:

a) Admixture: Type, quantity, physical and chemical properties that affect strength, workability and durability of concrete. For air entraining admixtures, dosage to be adjusted to maintain air contents within desirable limits.

b) Aggregate: Physical, chemical and mineralogical qualities. Grading, moisture content and impurities.

c) Water: Impurities tests.

d) Cement: Tests to satisfy relevant IS Specifications (only association with purchaser's tests, if the supply is made by purchaser).

e) Formwork: Material, shapes, dimensions, lines, elevations, surface finish, adequacy of form, ties, bracing & shoring and coating.

f) Reinforcement: Shapes, dimensions, and length of splices, clearances, ties and supports. Quality and requirement of welded splices. Material tests or certificates to satisfy relevant IS Specification (if contractor's supply).

g) Grades of concrete: Usage and mix design, testing of all properties.

h) Batching & Mixing: Types and capacity of plant, concrete mixers and transportation Equipment.

i) Joints: Locations of joints, water stops and filler materials. Dimension of joints, quality and shape of joint material and splices.

j) Embedded and Anchorage items: Material, shape, location, and setting.

k) Placing: Preparation, rate of pouring, weather limitations, time intervals between mixing and placing and between two successive lifts, covering over dry or wet surfaces, cleaning and preparation of surfaces on which concrete is to be placed,

application of mortar/slurry for proper bond, prevention of cold joint, types of chutes or conveyors.

l) Compaction: Number of vibrators, their prime mover, frequency and amplitude of vibration, diameter and weight of vibrators, duration of vibration, hand‑spreading, rodding and tamping.

m) Setting of base and beaming plates: Lines, elevations and bedding mortar.

n) Concrete finishes: Repairs of surface defects, screening, floating, steel trowel ling and brooming, special finishes.

o) Curing: Methods and length of Copies of records and tests for the items noted above, as well as, records of corrective action taken shall be submitted to the Engineer for approval as may be desired.

8.10 INSTALLATION:

All installation requirements shall be in accordance with IS:456 and as supplemented or modified herein or by other best possible standards where the specific requirements mentioned in this section of the specification do not cover all the aspects to the full satisfaction of the Engineer.

8.11 GRADES OF CONCRETE:

A) Concrete shall be either ordinary or controlled and in grades designated M‑10, M‑15, and M‑20 as specified in IS: 456 (latest edition). In addition, nominal mixes of 1:2:4 ;1:3:6 and 1:4:8 of nominal size aggregate of 20 mm maximum or as indicated on drawings, by volume or any other mix as per requirement shall be used where specified.

B) CONTROLLED CONCRETE:

* 1. General: Controlled concrete shall be used on all concrete works, except where specified.
  2. Mix Proportions: The mix proportions for all grades of concrete shall be designed to obtain strength corresponding to the values specified in IS: 456 for respective grade of concrete. Preliminary tests, as specified in the IS code or as required by the Engineer‑in‑charge, shall be carried out sufficiently ahead of the actual commencement of the work with different grades of concrete made from representative sample of aggregates and cement expected to be used on the job to ascertain the water cement ratio required to produce a concrete having specified strength and sufficient workability to enable it to be well consolidated and to be worked into corners of shuttering and around the reinforcement.

C) Mixes Design Criteria: Concrete mixes will be designed by the Contractor to achieve the strength, durability and workability necessary for the job, by the most economical use of the various ingredients. In general, the design will keep in view the following considerations:‑

a) Consistent with the various other requirements of the mix, the quantity of water should be kept at the lowest possible level.

b) The nominal maximum size of coarse aggregate shall be as large as possible within the limits specified.

* 1. The various fractions of coarse and fine aggregates should be mixed in such a proportion as to produce the best possible combined internal grading giving the densest and most workable mix.

d) The finished concrete should have adequate durability in all condition, to withstand satisfactorily the weather and other destruction agencies that it is expected to be subjected to in actual service. The requirement of adequate structural strength is catered for by the choice of proper grade of concrete by the Engineer. The Contractor will strictly abide by the same in his design of concrete mix installation .Not withstanding anything mentioned in various tables given in IS:456 giving specific values and degrees of workability for different condition of concrete placing, minimum cement content and maximum water‑cement ratio for concrete

exposed to sulphate attack and for concrete to ensure durability under different condition of exposure, strength requirement for different grades of concrete, proportion for nominal mix concrete, the following tables in the specification are included. For identical condition if values given in the tables shown herein below are different from those mentioned in IS: 456, the values as indicated in the table shown herein below shall prevail.

**TABLE ‑ II**

**MINIMUM CEMENT CONTENT SPECIFIED FOR DIFFERENT GRADES OF CONCRETE**

‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑-------------------------------------------

Grade of Minimum Cement Content/Cu.M

Concrete Concrete of finished

‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑-------------------------------------------

M –20 (design mix) 330 Kg

M – 25 (design mix) 360Kg

‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑-------------------------------------------

1. The minimum cement contents mentioned in Table III are for average conditions. The Engineer‑in‑charge shall have the right to revise the minimum cement content.

In this connection the Contractor shall abide by the following conditions.

* 1. The contractor shall design the mixes for 10% (Ten per cent) higher strength over and above those specified in Table I under Clause 11.11(C), for the various grades of concrete and different slump requirements.
  2. Sufficient number of trial mixes (to be decided by the Engineer) will be taken at the laboratory for the various designs and graphs of w/c ratio Vs crushing strengths at various ages will be plotted.
  3. All tests will be done in presence of the Engineer who shall be the final authority to decide upon the adoption of any revised minimum cement content. The contractor will always be responsible to produce quality concrete of the required grade as per the acceptance criteria of IS:456.
  4. The Engineer 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 on account of use of lower cement content or any other reason.

At least four trial batches are to be made and 7 test cubes taken for each batch noting the slump of each mix. The cubes shall then be properly cured and two cubes for each mix shall be tested in a testing laboratory approved by the Engineer‑in Charge at 7 days and others at 28 days for obtaining the compressive strength. The test reports shall be submitted to the Engineer‑in‑Charge. The cost of the mix design and testing shall be borne by the Contractor. All tests shall be done in the presence of Engineer‑in‑Charge.

Concrete tests specimens shall be made, cured and tested in conformation with IS: 517 (latest edition). These tests shall be conducted at approved laboratory. The modules and materials for cubes shall be supplied by the contractor who shall also arrange to transport the cubes/cylinders to laboratory at his cost.

The reports for each tentative concrete mix submitted for review shall include the following information.

i) Slump on which the design is based.

ii) Total liters of water per cubic meter.

iii) Water‑cement ratio.

iv) Ratio of fine to total aggregates.

v) Weight (surface dry) of each aggregate per cubic meter.

vi) Quantity of each admixture.

vii) Air content, if any.

viii) Compressive strength based on 7 days and 28 days compression tests.

ix) Time of initial set.

x) Time of final set.

xi) Weight of cement used in the mix.

1. On the basis of the above reports, a proportion of mix by weight and water cement ratio shall be approved by the Engineer‑in‑Charge which will be expected to give the required strength, consistency and workability and the proportions so decided for different grades of concrete shall be adhered to during all concreting operations. If however, at any time, the Engineer‑in‑Charge feels that the quality of material being used has changed from those used for preliminary mix design, the Contractor shall have to run similar trial mixes to ascertain the mix proportions and water cement ratio for obtaining the desired strength and consistency. The design mix particulars shall indicate by means of graphs and curves etc. the extent of variation in the grading of aggregate, which can be allowed.
2. In designing the mix proportions of concrete, the quantity of both cement and aggregate shall be determined by weight. The Engineer‑in‑charge may allow the quantity of aggregates to be determined by equivalent volume basis after the relationship between the weight and volume is well established by trial and the same shall be verified frequently. Water shall be either measured by volume in calibrated tanks of weighed. All measuring equipments shall be maintained in a clean and serviceable condition, and their accuracy periodically checked.
3. To keep the water cement ratio to the designed value, allowance shall be made for the moisture contents in both fine and coarse aggregates and determination of the same shall be made as frequently as directed by the Engineer‑in‑Charge. The determination of moisture contents shall be according to IS: 2386 (Part‑III).
4. It will be within the competency of the Engineer‑in‑Charge to reduce the number of trial batches and the number of test specimens mentioned above. Further the Engineer‑in‑Charge can also allow adoption of the mixes already tried and found satisfactory, with similar materials, for other jobs at the same site without any fresh design of mix.

D) STRENGTH REQUIREMENTS:

i) The mix proportions for all grades of concrete shall be designed to produce the grade of concrete having the required workability and a characteristic strength not less than the value given in Table‑I vide Cl.11.11(C).

ii) Should the work strength of concrete fall below the specified strength, the Engineer shall decide:

to reject the work, in which case the contractor shall replace the defective work with concrete of required strength and bear all costs for dismantling and replacing including the cost of associated form work, reinforcement, embedded parts and associated work.

(or)

to accept the work at a reduced rate, in which case the unit rate payable for substandard work will be reduced by the owner directly in proportion to the work strength as compared to the specified strength. The owner may, in addition, require other tests performed on the respective structural member so accepted prior to its acceptance with or without necessary/corrective measures and in each such case the contractor shall bear all costs for all such tests or corrective measures, besides the reduction in the unit rates as specified herein.

Concrete of strength below fifteen (15) percent of the specified strength will not be accepted.

iii) With permission of the Engineer‑in‑charge, for any of the above mentioned grades of concrete, if the water quantity has to be increased in special cases, cement shall also be increased proportionately to keep the ratio of water to cement same as adopted in trial

mix design for each grade of concrete. No extra payment for the additional cement will be made.

E) DURABILITY REQUIREMENT:

Tables 19 & 20 of IS:456 give the maximum water‑cement ratio permissible from the point of view of durability of concrete subjected to adverse exposure to weather, sulphate attacks, and contact with harmful chemicals. Impermeability may also be a important consideration.

Whenever the water‑cement ratio dictated by durability consideration is lower than that required from strength criterion, the former shall be adopted. However, water‑cement ratio, from the point of view of durability as well as from strength consideration, should meet the requirements given in Table No.II.

**TABLE‑V**

**LIMITS OF CONSISTENCY**

‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑---------------------------------------

Degree of Slump in mm with Standard Use for which concrete is suitable

Workability Cone as per IS: 1199

Min. Max ‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑

Very low 0 25 Large Mass concrete structure with heavy

compaction equipments, roads and like

Low 25 50 Un-congested wide and shallow RCC

Structures

Medium 50 100 Deep but wide RCC with congestion or

reinforcement and inserts

High 100 150 Very narrow and deep RCC structures with inserts congestion due to reinforcement and

‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑----------------------------------------

(Note: Notwithstanding anything mentioned above, the slump to be obtained for work in progress shall be as per direction of the Engineer).

The workability of concrete shall be checked at frequent intervals by slump tests. Alternatively where facilities exist or if required by the Engineer, the compacting factor test in accordance with IS:1199 and Clause 6 of IS:456 shall be carried out.

F) BATCHING:

i) In proportioning concrete, the quantity of both cement and aggregate should be determined by weight, where the weight of cement is determined on the basis of weight of cement per bag, a responsible number of bags should be weighed periodically to check the net weight. Where the cement is weighed on the site and not in bags it should be weighed separately from the aggregates. Water should be either measured by volume in calibrated tanks or weighed. Any solid admixture that may be added, may be measured by weight, liquid and paste admixture by volume or weight. Batching plant where used should conform to IS:4925‑1968. All measuring equipment should be maintained in a clean serviceable condition, and their accuracy periodically checked.

ii) Except where it can be shown to the satisfaction of the Engineer‑in‑charge that supply on properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate should be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportion when required, different sizes being stocked in separate stock files. The grading of coarse and fine aggregate should be checked frequently for a given job being determined by the Engineer‑in‑charge to ensure that the specified grading is maintained.

iii) Change from weigh batching to volume batching may be done only after obtaining

the specific permission of Engineer‑in‑charge in writing.

iv) The amount of the added water shall be adjusted to compensate for any observed variations in the moisture contents. For the determination of moisture content in the aggregates, IS:2386 (Part‑III) may be referred to. To allow for the variation in their moisture content, suitable adjustments in the weights of aggregate shall be made. In the absence of exact data, only in the case of Nominal Mixes, the amount of surface water may be estimated from the values given in Table‑C.

**TABLE‑C**

**SURFACE WATER CARRIED BY AGGREGATE**

Aggregate Approximate Qty. of surface water

Percent by Mass Liter M

Very wet sand 7.5 120

Moderately wet sand 5.0 80

Moist sand 2.5 40

Moist gravel or crushed rock 1.25‑2.5 20‑40

No substitutions in materials used on the work or alterations in the established proportions, except as permitted in Clauses 11.11(F)(iii) & (iv) shall be made without additional tests to show that the quality and strength of concrete are satisfactory.

8.12 WORKMANSHIP:

A) General:

All workmanship shall be according to the latest and best possible standards. Before starting a pour the Contractor shall obtain the approval of the Engineer‑ in‑Charge in a "Pour Card" maintained for this purpose. He shall obtain complete instructions about the material and proportion to be used, slump, workability, quantity of water per unit of cement, number of test cubes to be taken, type of finishing to be done, any admixture to be added, any limitation on size of pour and stopping of premature pours.

B) MIXING OF CONCRETE:

All control/design mix concrete shall be mixed at a single central batching plant situated within the area allocation for the Contractor's particular use as shown on the drawings. The plant shall have mechanically operated mixer of an approved size and type capable of ensuring a uniform distribution of the materials throughout the mass. The entire batch shall be discharged before recharging.

The proportions of the fine and coarse aggregate, cement and water shall be as determined by the mix design or according to fixed proportions in case of nominal mix concrete and shall always be approved by the Engineer‑in‑Charge. The quantities of the cement, fine and coarse aggregates shall be determined by weight, the water shall be measured accurately after giving proper allowance for surface water present in the aggregate for which regular check shall be made by the Contractor.

The water shall not be added to the mix until all the cement and aggregates constituting the batch are already in the drum and dry mix for at least one minute. Mixing of each batch shall be continued until there is a uniform distribution of the materials and the mixing done for less than two (2) minutes and at least forty (40) revolutions after all the materials and water are in the drum. When absorbent aggregates are used or when the mix is very dry, the mixing time shall be extended as may be directed by the Engineer in‑Charge. Mixers shall not be loaded above their rated capacity as it prevents thorough mixing. If there is segregation after unloading form the mixer the concrete should be remixed.

Before beginning a run of concrete all partially set or hardened concrete and foreign material shall be removed from the inner surfaces of mixing and conveying equipment. The first batch of concrete, through a cleaned mixer, for use in the works, shall contain 10% additional cement at no extra cost to the owner, to allow for loss in the drum.

C) CONVEYING CONCRETE:

a) Concrete shall be handled and conveyed from the place of mixing to the place of laying as rapidly as practicable by approved means and placed and compacted in the final position before the initial setting of the cement starts. Concrete should be conveyed in such a way as will prevent segregation or loss of any of the ingredients. For long distance haulage, agitator cars of approved design will be used. If, in spite of all precautions, segregation does occur during transport, the concrete shall be properly remixed before placement. During very hot or cold weather, if directed by the Engineer, concrete shall be transported in deep containers which will reduce the rate of loss of water by evaporation or loss of heat. If necessary, the container may have to be covered and insulated. Conveying equipments for concrete shall be well maintained and thoroughly cleaned before commencement of concrete mixing. Such equipments shall be kept free from set concrete. Concrete shall not be delivered by spout or troughs nor dumped into carriers with a free fall from the mixer of more than 1 nut.

b) No concrete shall be placed except in the presence of the Engineer‑in‑Charge or his authorised representative. Concrete which is not placed in accordance with the specifications or which is of inferior quality as determined by the Engineer‑in Charge, shall be removed and replaced by the Contractor, the entire cost of which shall be borne by the contractor.

c) Before any concrete is placed, the entire placing programme consisting of equipment, layout, proposed procedure and methods shall be submitted in writing to the Engineer‑in‑Charge for approval and no concrete shall be placed until his approval has been received.

d) Concrete shall be conveyed to the point of final deposit by methods which will prevent the separation or loss of the ingredients. Concrete shall be deposited in its final position without moving it laterally in the forms for a distance in excess of 1.5 meters.

D) Placing and Compacting Concrete:

a) Where specifically covered, the relevant IS Code will be followed for the procedure of surface preparation, placement, consolidation, curing, finishes, repairs and maintenance of concrete. If, however, there is no specific provision in the relevant IS Code for any particular aspect of work, any other standard code of practice, as may be specified by the Engineer, will be adopted. Concrete may have to be placed against the following types of surfaces:

1. Earth foundation
2. Rock foundation

iii) Formwork

1. Construction joint in concrete or masonry.

The surface on or against which concrete is to be placed has to be cleaned thoroughly. Rock or old construction joint has to be roughened by wire brushing, chipping, sand blasting or any other approved means for proper bond. All cuttings, dirt, oil, foreign and deleterious material, laitance, etc. are to be removed by air water jetting or water at high pressure. Earth foundation on which direct placement of concrete is allowed, will be rammed and consolidated as directed by the Engineer such that it does not crumble and get mixed up with the concrete during or after placement, before it has sufficiently set and hardened.

b) Formwork, reinforcement, preparation of surface, embedment, joint seals etc., shall be approved in writing by the Engineer before concrete is placed. As far as possible, concrete shall be placed in the formwork by means approved by the Engineer and shall not be dropped from a height or handled in a manner which may cause segregation. Any drop over 1500 mm shall have to be approved by the Engineer.

c) Rock foundation or construction joint will be kept moist for at least 72 hours prior to placement. Concrete will be placed always against moist surface but never on pools of water. In case the foundation cannot be dewatered completely, special procedure and precaution, as directed by the Engineer will have to be adopted.

d) Formwork will be cleaned thoroughly and smeared lightly with form oil or grease of approved quality just prior to placement. Before concrete is placed, forms, reinforcement, anchor bolts and embedment shall be rigidly secured in proper position. Concrete shall be deposited in its final position without segregation, rehandling or following or loss of liquid from concrete. The interval between adding the water to the dry materials in the mixer and the completion of the final placing inclusive of compaction of the concrete shall be well within the initial setting time for the particular cement in use or as directed by the Engineer‑in‑charge.

e) A layer of mortar of thickness 12 mm of the same or less w/c ratio and the same proportion as that of the concrete being placed and cement slurry will be spread thoroughly on the rock foundation or construction joint just prior to placement of concrete. The cost of application of such cement slurry and mortar will be deemed to be included in the unit rate of concrete.

f) To ensure bond and water tightness between old concrete surface and the concrete to be placed, the surface should be cleaned and roughened by "initial green out" by wire brushing or chipping. The initial green cutting may be done after 6 hours of placing concrete in order to facilitate the work. Before plastering, the surface shall be thoroughly hacked. The bonding of old and new concrete should be done by applying the cement slur after thoroughly watering the old concrete surface and removing all free particles.

g) The placing of concrete shall be a continuous operation with no interruption in excess of 30 minutes between the placing of continuous portions of concrete.

h) After concrete has been placed, it shall be spread, if necessary and thoroughly compacted by approved mechanical vibration to maximum subsidence without segregation and thoroughly worked around shape. To secure maximum density and eliminate formation of air pockets, the concrete shall be thoroughly vibrated and worked around all reinforcement, embedded facilities and into corners or forms during and immediately after placing. Unless other methods are authorised by the Engineer‑in‑charge, mechanical vibrators conforming to IS: 2505, IS: 2506, IS: 2514 and IS: 4656 (all latest edition) shall be used for this purpose, the type and operation of which is subject to the approval of the Engineer‑in‑charge. The extent of vibration shall be through the entire depth and width of each new layer. Duration of vibration shall be sufficient to accomplish thorough compaction and complete embedment of reinforcement. Due to vibration , the tendency for large aggregate to gravitate to lower elevations shall not relieve the contractor from his responsibility of obtaining a uniform density throughout the mass. Excess cement paste thus formed at the top of each layer shall be removed before the succeeding layer is deposited.Vibrators shall not be used for pushing concrete into adjoining areas. Vibrators must be operated by experienced workmen and the work carried out as per relevant IS Code of Practice. In thin members with heavy congestion of reinforcement or other embedment, where effective use of internal vibrator is, in the opinion of the Engineer, doubtful, in addition to immersion vibrators the contractor may have to employ form vibrators conforming to IS:4656. For slabs and other similar structures, the contractor will additionally employ screed vibrator as per IS:2506. Hand tamping may be allowed in rare cases, subject to the approval of the Engineer. Care must be taken to ensure that the inserts, fixtures, reinforcement and formwork are not displaced or distorted during placing and consolidation of concrete. Contractor shall provide proper equipment or methods for compaction of concrete or covers or other similar areas where conventional methods would not be adequate.

i) Immersion type vibration shall be provided at the rate of at least one 65 mm unit per cu.m. per hour together with at least one stand by vibrator of the appropriate size. Vibrators shall be inserted in the concrete at a sufficient number of places so that their fields of influence overlap and shall not be used to work the concrete along with forms or screeds. Vibrators shall be withdrawn causing segregation; surface laitance or leakage through the forms shall be avoided. Where electrically operated vibrators are used, diesel or petrol driven stand by vibrators shall be available for carrying on uninterrupted vibration in case of a power failure.

j) Concrete to be vibrated shall be placed in level layers of suitable thickness not greater than the effective length of the vibrator needle. The concrete at the surface shall not be distributed as horizontally as possible, the vibration shall not be done in the neighbourhood of slopes. The internal vibrator shall not be used to spread the concrete for filling. It is advisable to deposit concrete well in advance of the point of vibration. When the concrete is being continuously deposited to a uniform depth along a member, vibrator shall not be operated too near to the free end of the advancing concrete, usually not within 1.20 meters of it. Every effort shall be made to keep the surface of the previously placed layer of concrete alive so that the succeeding layer can be amalgamated with it by vibration process. Following points shall be kept in mind while vibrating concrete.

k) The concrete shall be placed in shallow layers consistent with the method being used to place and vibrate the concrete. Usually concrete shall be placed in thickness not more than 300 mm and on initial placing in thickness not more than 150 mm.

l) The vibrator head shall be dipped through filling which is to be consolidated to further depth of 10 to 20 mm in the lowest layer which has already been consolidated.

m) Vibration shall be carefully controlled, the internal vibrator being systematically inserted at points minimum 450 mm and maintained in position for a fixed time. Immersion for periods of 5 to 15 seconds should normally be sufficient. The limit of action is judged by surface appearance. The surface shall neither be honey combed nor shall it contain excess mortar.

n) The vibrator shall be inserted vertically, with inclined or haphazard insertion it will be impossible to regulate the degree of compaction in all portions of the concrete. Care shall be taken to prevent contact of immersion vibrators with form work, reinforcement steel and finished surfaces. Immersion vibrators shall not come in contact with reinforcement steel if initial set of concrete around it has started.

o) The vibrator shall be allowed to penetrate on its own accord and should be withdrawn quite slowly, at the rate of about 75 mm per second, whilst still running, so as to allow the redistribution of the concrete in its wake.

p) The rate of placement of concrete shall be such that no cold joint is formed and fresh concrete is placed always against green concrete that is still plastic and workable. No concrete shall be placed in open, is to be attempted unless sufficient tarpaulins or other similar protective arrangement for completely covering the still green concrete from rain is kept at the site of placement. If there has been any sign of washing of cement and sand, the entire affected concrete shall be removed immediately. Suitable precautions shall be taken in advance to guard against rains before leaving the fresh concrete unattended. No accumulation of water shall be permitted on or around freshly laid concrete.

q) Slabs, beams and similar members shall be poured in one operation, unless otherwise instructed by the Engineer. In special circumstances with the approval of the Engineer‑in charge, these can be poured in horizontal layers not exceeding fifty (50) cm. in depth. When poured in layers, it must be ensured that the under layer, is not already hardened. Bleeding of under layer if any, shall be effectively removed. Moulding, throating, drip course, etc. shall be poured as shown on the drawings or as directed by the Engineer. Holes shall be provided, and bolts, sleeves, anchors, fastenings or other fixtures shall be embedded in concrete as shown on the drawings or as directed by the Engineer. Any deviation there from shall be set right by the Contractor at his own expense as instructed by the Engineer.

r) Concrete shall be deposited in a manner to prevent displacing facilities or reinforcement above the level of the fresh concrete, and the formation of seams or planes of weakness within the sections. Each layer shall be deposited as close to its final position as practicable in order to prevent segregation.

s) In case the forms or supports get displaced during or immediately after the placement and bring the concrete surface out of alignment beyond tolerance limits, the Engineer may direct to remove the portion and reconstruct or repair the same at the Contractor's expense.

t) The Engineer shall decide upon the time interval between two placements of concrete of different ages coming in contact with each other, taking in consideration the degree of maturity of the older concrete, shrinkage, heat dissipation and the ability of the older concrete to withstand the load imposed upon it by the fresh placement.

u) Once the concrete is deposited, consolidated and finished in its final position, it shall not be disturbed.

v) Whenever vibration has to be applied externally the design of formwork and the disposition of vibrators shall receive special consideration to ensure efficient compaction and to avoid surface blemishes. After initial set of concrete the forms shall not be jarred and no strain or vibration equipment shall be placed on the ends of projecting reinforcement.

w) Concrete shall not ordinarily be placed under water. In unavoidable cases, such concreting shall be done only with the specific approval of procedure and application by the Engineer‑in‑charge. The concrete shall contain at least 10 percent more cement than that required for the same mix placed in the dry, the quality of extra cement varying with condition of placing. The relevant clauses of IS:456 (latest edition) should be adhered to 11.12(D)(w). Retamping of concrete or mortar which has partially hardened shall not be permitted.

x) It is imperative that all excavations prepared for concrete construction be maintained free of water until such concrete work is completed. The contractor shall make provisions and furnish equipment as required for such dewatering, subject to approval by the Engineer‑in‑charge. Water used for flushing concrete placing equipment shall be discharged clear of the concrete and forms.

y) Contractor shall keep an accurate record of the date on which the concrete is cast for each part of work and date on which the forms are removed.

E) **Cold Weather concreting**:

When conditions are such that the ambient temperature may be expected to be 4.5 deg.C or below during the placing and curing period, the work shall conform to the requirement of Clause 13 of IS:456 and IS:7861.

**F) Hot Weather concreting**:When depositing concrete in very hot weather, the contractor shall take all precautions as per IS:7861 and stagger the work in the cooler parts of the day to ensure that the temperature of wet concrete used in massive structures does not exceed 38 deg. C while placing. Positive temperature control by pre-cooling, post cooling or any other method, if required, will be specified and paid for separately.

8.13 **Construction Joints**:

i) The locations and details of construction joints must be got approved from the Engineer‑in‑charge before concrete is poured. Concreting shall be carried continuously up to construction joints.

ii) At least two hours must lapse after depositing concrete in the columns or walls before depositing in beams, girders or slabs supported thereon. Beams, girders, brakets and haunches shall be considered as part of the floor system and shall be placed monolithically therewith.

iii) Construction joints in foundations of equipment shall not be provided without specific concurrence of the Engineer‑in‑charge.

iv) It is always desirable to complete any concrete structure by continuous pouring in one operation. However, due to practical limitation of methods and equipment and certain design considerations, construction joints are formed by discontinuing concrete at certain predetermined stages. These joints will be formed in a manner specified in the drawings/instruction. Vertical construction joints will be made with rigid stop‑board forms having slots for allowing passage of reinforcement rods and any other embedment and fixtures that may be shown of desired by the Engineer‑in‑charge keep and/or dowel bars shall be provided at the construction joints. For water retaining structures and leak proof buildings suitable and approved water stops may be installed at the construction joints as per Clause 12.4 of IS: 456. Where the location of the joints are not specified, it will be in accordance with the following:‑

1. In a column, the joint shall be formed 75 mm below the lowest soffit of the beam framing into it.
2. Concrete in a beam shall preferably be placed without a joint, but if provision of a joint is unavoidable, the joint shall be inclined as given in the relevant standards.
3. Joint in a suspended floor slab shall be vertical and between 1/4th to 1/3 of the span from its ends and at right angles to the principal reinforcement.
4. Feather‑edges in concrete shall be avoided while forming a joint.
5. A construction joint should preferably be placed in a low stress zone and at right angles to the direction of the principal stress.
6. In case the contractor proposes to have a construction joint anywhere to facilitate his work, the proposal should be submitted well in advance to the Engineer for study and approval without which no construction joint will be allowed.

v) When the work has to be resumed on a surface that has hardened, such surface shall be roughened. It shall then be swept clean, thoroughly wetted, and covered with a 15 mm layer of mortar composed of cement and sand in the ratio of 1:1.

This 15 mm layer of mortar shall be freshly mixed and placed immediately before the placing of the concrete. The new concrete shall be worked against the prepared surface before the slurry sets. Special care shall be taken to see that the first layer of concrete placed after a construction joint is thoroughly rammed against the existing layer. Old joints during pour shall be treated with 1:1 freshly made cement sand slurry only after removing all loose materials.

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

8.14 Repairs & finishes of concrete:

A) Adequate and sound concrete surfaces, whether formed or unformed, can be obtained by employing a concrete mix of proper design, competent formwork, appropriate methods of handling, placing and consolidation by experienced workmen.

B) All concrete surface either cast‑in‑site or pre‑cast shall have even, clean finish, free from honey combs, air bubbles, fins or other blemishes.

C) Unsound concrete resulting from improper mix design, incompetent methods, equipment and formwork, poor workmanship and protection will not be accepted and will have to be dismantled, removed and replaced by sound concrete at the Contractor's cost. The Engineer may, at his sole discretion, allow retaining concrete with minor defects provided the Contractor is able to repair it by approved methods at no extra cost to the Purchaser. All concrete work shall be inspected by the Contractor immediately after the forms are removed and he will promptly report occurrence of any defects to the Engineer. All repair works will be carried out as per the instructions and in the presence of the Engineer or his representative. Generally, repair work will consist of any or all of the following operations:‑

1. Sack rubbing with mortar and stoning with carborundum stone.
2. Cutting away the defective concrete to the required depth and shape.
3. Cleaning of reinforcement and embedment.
4. Roughening by sand blasting or chipping.
5. Installing additional reinforcement/welded mesh fabric.
6. Dry packing with stiff mortar.
7. Plastering, grunting, shotereting etc.
8. Placing and compacting concrete in the void left by cutting out defective concrete.
9. Grouting with cement sand slurry of 1:1 mix.

D) The requirement of finishes of formed surfaces are given separately under Clause 13.6 of this specification. The Contractor is to include in his quoted rate for concrete, the provision of normal finishes in unformed surfaces which can be achieved by screening, floating, toweling etc., as and where required by the Engineer without any extra cost to the Purchaser. A few typical and common cases of treatment of concrete surface are cited below.

a) Except where a special finish is called form all exposed concrete shall be finished as follows.

b) All fins and other projections shall be neatly chipped, rubbed down and made smooth; form oil shall be entirely removed by stiff fiber brushes. The use of acid shall not be permitted. All exposed corners shall be slightly rounded or chamfered.

Air holes, cavities and similar imperfections shall be first saturated with water and filled with a mortar mixture of composition as that used in the concrete. After initial set of mortar the surface shall be rubbed down with burlap. A stucco coat shall be allowed to be applied to the surface.

c) i) Floor:

Whenever a non‑integral floor finish is indicated, the surface of reinforcement concrete slab shall be struck off at the specified levels and slopes and shall be finished with a wooden float fairly smooth removing all laitance. No over‑toweling, to obtain a very smooth surface, shall be done, as it will prevent adequate bond with the subsequent finish. If desired by the Engineer, the surface shall be scored and marked without any extra cost to the Purchaser to provide better bond. Where monolithic finish is specified or required, concrete shall be compacted and struck off at the specified levels and slopes with a screed, preferably a vibrating type and then floated with a wooden float. Steel trowel ling is then started after the moisture film and shine have disappeared from the surface and after the concrete has hardened enough to prevent excess of fines and water to rise to the surface but not hard enough to prevent proper finishing of aberrations. Steel trowel ling properly done will flatten and smoothen sandy surface left by wooden floats and produce a dense surface free from blemishes ripples and trowel marks. A fine textured surface that is not slick and can be used where there is likelihood of spillage of oil or water can be obtained by trowel ling the surface lightly with a circular motion after initial trowel ling keeping the steel trowel flat on the surface. To provide a better grip the Engineer may instruct marking the floor in a regular geometric pattern after initial trowel ling.

ii) Beams, columns & walls:

If on such or any other concrete structure it is intended to apply plaster or such concrete surfaces against which brickwork or other allied works are to be built, the contractor shall hack the surface adequately as soon as the form is stripped off so that proper bond can develop. Pattern, adequacy and details of such hacking shall meet with the approval of the Engineer, who shall be informed to inspect such surfaces before they are covered up.

d) Concrete surfaces to be subsequently plastered or where brickwork shall be built against it shall be adequately hacked as soon as the form is stripped off so that proper bond can develop.

8.15 CURING OF CONCRETE:

A) Curing shall be as per this specification and IS: 456. Unless otherwise specified all concrete shall be moist cured by keeping all exposed surfaces, edges and corners continuously moist for at least twenty one days after being placed, by spraying, ponding or covering with waterproof paper or moisture retaining fabric.

B) Newly placed concrete shall be protected by approved means from rain, sun and wind. Concrete placed below the Ground level shall be protected against contamination from falling earth during and after placing. Concrete placed in Ground containing deleterious substances, shall be protected from contact with such Ground, or with water draining from such Ground, during placing of concrete and for a period of at least three days or as otherwise instructed by the Engineer. The Ground water around newly poured concrete shall be kept to an approved level by pumping out or other adequate means of drainage to prevent floatation or flooding. Steps, as approved by the Engineer, shall be taken to protect immature concrete from damage by debris, excessive loadings, vibration, abrasion, mixing with earth or other deleterious materials, etc. that may impair the strength and durability of the concrete.

As soon as the concrete has hardened sufficiently, it shall be covered either with sand, Hessian, canvas burlap or similar materials which will hold moisture for long period and prevent loss of moisture from concrete and kept continuously wet for at least 18 (eighteen) days after final setting. Curing by continuous sprinkling of water will be allowed if the Engineer is satisfied with the adequacy of the arrangements made by the Contractor.

Curing of concrete shall start after 8 hours of placement and in hot weather within 4 hours of placement of exposed faces. During the first 24 hours, the concrete shall be cured by use of wet burlap or such other means to cover the concrete surfaces. In very hot weather, precaution shall be taken to see that the temperature of wet concrete does not exceed 38 deg. C while placing.

Concrete slabs and floors shall be cured by flooding with water of minimum 25 mm depth for the period mentioned above. Approved curing compounds may be used in lieu of moist curing with the permission of the Engineer‑in‑charge. Such compounds shall be applied to all exposed surfaces of the concrete as soon as possible after the concrete has set.

The contractor shall remain extremely vigilant and employ proper equipment and workers under able supervision for curing. The Engineer's decision regarding the adequacy of curing is final. In case any lapse on the part of the contractor is noticed by the Engineer, he will inform the contractor or his supervisor verbally or in writing to correct the deficiency in curing. If no satisfactory action is taken by the contractor within 3 (three) hours of issuance of such instruction, the Engineer will be at liberty either to employ sufficient means through any agency to make good the deficiency and recover the cost thereof from the contractor, or pay for the part where adequate curing was noticed at a reduced rate, entirely at the discretion of the Engineer.

C) WASH WATER:

Wash water shall be removed in a manner to prevent running down and staining of concrete surfaces which will be exposed at the completion of the work. Should unsightly wash water streak develop on the exposed surfaces, they shall be removed and water has to be lead to a suitable place as directed by Engineer‑ in charge.

8.16 METHOD OF MEASUREMENT**:**

A) Actual volume of work as executed as per drawing issued, whichever is less, shall be measured in cubic meter correct up to second place of decimal. Deductions for openings, conduits, pipes, ducts, pockets, chases etc. shall be made, provided they are larger than 0.1 sq.m. in area (for each opening unto and less than 0.1 sq.m. in area the formwork shall not be paid for separately).

B) No deduction shall be made for embedded fixtures including reinforcements, sleeves, anchor bolts and similar items.

C) MEASUREMENT & PAYMENT:

a) Payment for plain and reinforced cement concrete in site shall be made on Cubic Meter basis of the actual finished work done or as per approved construction Drawings, corrected up to second place of decimals, whichever is less and shall be inclusive of all labour, materials, curing, cost of leaving pockets, and providing one cost of cement wash, opening in walls and slab, recesses of all sizes, providing benching, making channels in manhole bottom etc. The rate shall also include supply and application of cement slurry prior to concreting of construction joints. The rates shall be deemed to include complete cost of taking and testing concrete cubes and carrying out other tests as per specifications and as directed by Engineer‑in‑charge.

b) Payment for concrete covered under this item is inclusive of organizing continuous pours as indicated on the drawings and no extra shall be payable on this account.

c) The rejected concrete shall be dismantled at no extra cost to the Owner nor any payment will be made for the concrete so rejected and the shuttering and reinforcement used for the same.

e) Deductions for pockets shall be as specified in relevant Indian Standards.

8.17 Sampling & Testing in field:

A) Grading Test:

Grading tests on coarse and fine aggregates shall be carried out at intervals specified by the Engineer‑in‑ charge.

B) Slump Test or Concrete:

At least one slump test shall be made for every compressive strength test carried

out. More frequent test shall be made if there is a distinct change in work conditions, or if required by the Engineer ‑in charge.

C) Strength test of concrete:

a) Samples of concrete shall be taken at the direction of the Engineer‑in‑charge in the field in accordance with IS: 1199 "Methodist of sampling and analysis of concrete".

b) These shall be tested for strength and consistency at an approved Government laboratory as specified by the Engineer‑in‑charge in accordance with IS:517. The moulds and material for cubes and cylinders shall be supplied by the contractor who shall also arrange to transport the cubes/cylinders to laboratory at his cost. Actual cost of the testing shall be borne by the contractor.

c) The acceptance criteria for the compressive strength shall be as per IS: 456. Only the slump indicated for the approved design mix shall be adopted. However, larger slumps than those indicated in approved design mix, of concrete of a specified grade (strength) may be necessary to get a workable consistency for concrete in case of beams, columns and other heavily reinforced members. No extra payment shall be made for extra cement that may have to be added in such cases to get the concrete of the same specified grade (strength) with larger slumps. The decision of Engineer‑in‑charge regarding the degree of consistency of the amount of slump shall be final.

d) Samples shall be cured under laboratory conditions, except when in the opinion of the Engineer‑in‑charge extreme weather condition may prevail at which time the Engineer‑in‑charge may require curing under job conditions.

e) If the test strength of the laboratory controlled cubes/cylinders for any portion of the concrete work falls below the compressive strength specified, the Engineer‑in‑charge shall have the right to order a change in the proportion or the water content for the remaining portion of the structure.

f) If the test strength of the job cured cubes/cylinders falls below the specified strength, the Engineer‑in‑charge shall have the right to require provision for temperature and moisture control during curing as necessary to secure the required strength and may require retests in accordance with "Standard method of securing, preparing and testing specimens from hardened concrete for compressive and flexural strength or order load tests to be made on the portion of the building so affected. All such tests shall be made contractor's expenses.

g) When the cubes tested reveal a strength lower than those specified, the acceptance criteria for such concrete shall be decided as stipulated in IS:456 (latest edition). The Engineer‑in‑charge shall also reserve the right to reject whole or any part of the work. In case of acceptance of such works the standard deviations shall be worked out and examined by the Engineer‑in‑charge and if he is satisfied, only then such work can be accepted at the reduced rate. The amount to be deducted shall be decided by the Engineer‑in‑charge.

h) For the purposes of statistical analysis any cube result, which in the opinion of Engineer‑in‑charge is due to improper sampling, molding or testing shall be discarded and a dummy result shall be substituted. The value of the cubes from the same grade of concrete tested immediately before and after the discarded value.

i) The contractor shall prepare and submit to the Engineer‑in charge a sample form to be used during the batching and mixing of the concrete. The form shall provide for entries to be made which will indicate the quantity of each material placed in each mixer, the mixer identification number, the batch number, the duration of time the batch was mixed, and the name or initials of the person recording the information.

j) The contractor is responsible for recording the required information for each batch of concrete and for submitting the required number of copies of completed form to the Engineer‑in charge.

k) Strict quality control shall be exercised in all concreting works and the acceptance criteria of concrete shall be in accordance with IS: 456‑2000.However, in exceptional circumstances the Engineer‑in‑charge may, at his discretion, accept a concrete of lower strength than specified and which is otherwise acceptable according to IS: 456‑2000.

l) Failure of the concrete to meet the early age strengths at 7 days shall be considered a failure of the concrete to meet the strength requirements and the Engineer‑in‑charge in such instances shall have the right to stop construction. The early age strength shall be the mean strength at the specified age minus 2 times standard deviation for the specified age as given in clause 11.21 (B) .

m) Concrete work found unsuitable for acceptance shall be dismantled and replacement is to be done as per specification by the contractor. No payment for the dismantled concrete, the relevant form work and reinforcement embedded fixtures, etc. wasted in the dismantled portion shall be made. In the course of dismantled, if any damage is done to the embedded items or adjacent structures, the same shall be made good, free of charge by the contractor to the satisfaction of the Engineer‑in‑charge.

n) The dimension of concrete as cast when compared with those on the drawings shall be within the tolerances specified on IS Code. No reduction will be permitted in the cover to reinforcement because of a specified negative tolerance in a concrete section.

o) Only the slump indicated in the approved design mix shall be adopted. However larger slumps than those specified grade (strength) may be necessary to get a workable constituency for concrete in case of beams, columns and other heavily reinforced members. No extra payment shall be made for extra cement that may have to be added in such cases to get the concrete of the same specified grade (strength) with larger slumps. The decision of Engineer‑in‑charge regarding the degree of constancy or the amount of slump shall be final.

8.**18 FREQUENCY OF SAMPLING:**

The minimum frequency of sampling of concrete for each grade shall be in accordance the following:

Quantity of concrete Number of samples

in the WORK M3

1 ‑ 5 1

6 –15 2

17‑ 30 3 31‑50 4

51 and above 4 Plus one additional sample for each additional 50 M3 or part thereof.

A) Test Specimens: Six test specimens shall be made from each sample first testing three at 7 days & after three at 28 days.

B) Test Strength of Sample: The test strength of the sample shall be the average of the strength of three specimens. The individual variation should not be more than + 15 per cent of the average.

8.19 STANDARD DEVIATION:

A) STANDARD DEVIATION BASED ON TEST RESULTS:

1. Number of test results: The total of test results required to constitute and acceptable record for calculating of standard deviation shall be not less than 30. Attempts should be made to obtain the 30 test results, as early as possible, when a mix is used for the first time.
2. Standard deviation to be brought up to date: The calculation of the standard deviation shall be brought up to date after every change of mix design and at least once a month.
3. Concrete of each grade shall be analysed separately to determine its standard deviations.

B) Assumed Standard Deviation: Where sufficient test results for a particular grade of concrete are not available, the value of standard deviation given in Table D may be assumed.

T A B L E ‑ D

ASSUMED STANDARD DEVIATION

Grade of concreteAssumed Standard Deviation N/mm2

M‑10 2.3

M‑15 3.5

M‑20 4.6

However, when adequate past records for a similar grade exist and justify to the designer a value of standard deviation different from that shown in Table‑D, it shall be permissible to use that value.

C) IS Codes:

Important relevant IS for this Section:

IS: 456 Code of practice for plain and reinforced concrete.

IS: 1199 Methods of sampling and analysis of concrete.

IS: 1838 Preformed fillers for expansion joints in concrete non‑extruding and resilient type (bitumen impregnated filler).

IS: 2386 Part III: Specific gravity, density, voids, absorption and buckling.

IS: 2505 General requirements for concrete vibrators, immersion type.

IS: 2506 Screed board concrete vibrators.

IS: 2514 Concrete vibrating tables.

IS: 3025 Methods of sampling and test (physical and chemical) for water

used in industry.

IS: 3370 Code of practice for concrete structure for the storage of liquids.

IS: 3350 Methods of tests for routine control for water used in

industry.

IS: 4656 Form vibrators for concrete.

IS: 517 Methods of test for strength of concrete.

**9.0 TECHNICAL SPECIFICATION FOR REINFORCEMENT:**

A) SCOPE:

This section of the specification shall cover furnishing of working drawings with bar‑bending schedule and the furnishing, cleaning, bending placing with arrangements for chairs, supports and suitable covers if reinforcement steel plain or deformed for all reinforced concrete works, below and above Ground level for complete pits as per drawings and specification.

B) Contractor shall supply, fabricate and place reinforcement to shapes and dimensions, as per IS:2502 "Code of Practice for bending and fixing bars for concrete reinforcement" and as indicated in approved drawings of the contractor.

C) MATERIALS:

Mild steel round bars, cold twisted and deformed bars as medium tensile or high yield strength steel confirming to IS:432 and IS:1786‑1979, plain hard drawn steel wire fabric etc will be used as reinforcement as per drawings and directions. Reinforcement accessories shall also be supplied by the contractor in the rates quoted for reinforcement.

D) BAR BENDING SCHEDULES**:**

The contractor shall submit to the Engineer for approval Bar Bending Schedules with working drawings in triplicate, showing clearly the arrangements proposed by the contractor, within one month of receipt of the Letter of Intent or of the receipt of the relevant approved design of the drawings, whichever is later. Upon receipt of the Engineer's final approval of the Bar Bending Schedule and drawings, the contractor shall submit 6 (six) prints of the final drawings with one reproducible print after incorporating necessary modifications or corrections, for final record and distribution. Approval of such detailed drawings by the Engineer shall not relieve the contractor of his responsibility for correctness nor of any of his obligations to meet the other requirements of the contract. Any adjustments in reinforcement to suit field conditions and construction joints other than shown on approved drawings shall be subject to approval of Engineer‑in‑charge/consultant. The payment for above is deemed to have been included in the rates quoted for reinforcement item. The contractor shall adhere strictly to requirements for a concrete cover over steel reinforcement, projection of bars for bending with future extensions, reinforcement, mesh reinforcement and other items to connection with proper placing.

E) CLEANING**:**

All steel for reinforcement shall be free from loose scales, oil, grease, paint or other harmful matters immediately before placing the concrete.

F) BENDING:

a) Unless otherwise specified, reinforcing steel shall be bent in accordance with the procedure specified in IS: 2502 or as approved by the Engineer. Bends and shapes shall comply strictly with the dimensions corresponding to the approved Bar Bending Schedules. Bar Bending Schedules shall be rechecked by the contractor before any bending is done and he shall be entirely responsible for its correctness. Bars correctly bent shall only be used.

b) No reinforcement shall be bent when already in position in the work, without approval of the Engineer, whether or not it is partially embedded in concrete. Bars shall not be straightened in a manner that will injure the material. Re-bending bars shall be bent by machine or other approved means producing a gradual and even motion. All the bars shall be cold bent unless otherwise approved. Bending hot at a cherry‑red heat (not exceeding 845 deg. C) may be allowed under very exceptional circumstances except for bars whose strength depends on cold working. Bars bent hot shall not be cooled by quenching. Bars shall be properly lagged for easy identification.

c) In no case shall the clear distance between bars be less than the diameter of the bar not less than one third of the max. size of coarse aggregate. Reinforcement shall be bent in accordance with procedure specified in IS:2502 code of practice for bending and fixing of bars for concrete reinforcement and shall not be straightened in manner that will injure the material.

d) Expanded portion of reinforcement bars must not be subjected to impact or rough handling and workers will not be permitted to climb on bar extensions until the concrete has sufficient strength so that no movement of the bar in the concrete is possible.

e) Where reinforcement bars are bent at site at construction joints and afterwards bent back into their original positions. Care should be taken to ensure that at no time is the radius of the bend less than 4x bar diameters for plain mild steel or 6 x bar diameters for deformed bars. Care shall also be taken when bending back bars, to ensure that the concrete around the bar is not damaged.

G) SPLICING:

a) All reinforcement shall be furnished in the full length indicated on the drawing. Splicing of the bars except where shown on the drawings will not be permitted without the written permission of the Engineer‑in‑charge.

b) At a compression splice each pair of lapped bars may be in contact but the minimum clear spacing between the splice and the adjacent splice shall be that specified for adjacent single bars.

H) PLACING IN POSITION:

a) All reinforcements shall be accurately fixed and maintained in position as shown on the drawings by such approved and adequate means like mild steel chairs and/or concrete spacer blocks irrespective of whether such supports are payable or not. Bars intended to be contact at crossing points, shall be securely tied together at all such points by No.20 G annealed soft iron wire or by tack welding in case of Bar larger than 25 mm dia., as may be directed by the Engineer. Binders shall tightly embrace the bars with which they are intended to be in contact and shall be securely held. The vertical distance between successive layers of bars shall be maintained by provision of mild steel spacer bars. They should be spaced such that the main bars do not sag perceptibly between adjacent spacers. Before actual placing, the contractor shall study the drawings thoroughly and inform the Engineer in case he feels that placement of certain bars is not possible due to congestion. In such cases he should not start placing any bar before obtaining clearance from the Engineer.

b) The reinforcement accessories shall be furnished by the contractor. The wire shall be of annealed iron wire quality. Bar supports, charis, spreaders, spacers and bolsters shall be sufficiently heavy to support the reinforcement steel properly and shall be approved by the Engineer‑in‑charge. No separate payment shall be made on account of the above and the unit rate shall be inclusive of the cost of binding wire, bar supports, chairs bolsters, spacers etc. However when steel is supplied by the owner/purchaser a detailed record of the above shall be kept for purpose of only calculating the theoretical consumption but not for payment.

I) WELDING:

a) Normal bond laps in reinforcement may be placed by lap or butt-welding reinforcement bars, if asked by the Engineer, under certain conditions. The work should be done with suitable safeguards in accordance with relevant Indian Standards & IS:2751 for welding of mild steel bars used in reinforced concrete construction as per IS: 2751 and IS:456. Welded mesh fabrics conforming to IS: 1566 may also be used if specified in the Schedule of items and drawings.

b) Field welding of reinforcing bars will not be permitted without the written consent of the Engineer‑in‑charge. Where welding is permitted it must be at suitable staggered locations. Tests shall be made to prove that joints are of the full strength of bards connected. Welding of reinforcement shall be done in accordance with the recommendation of IS:2751. This clause applies to main and distribution steel only.

c) In those places where welded reinforcement chairs, spacer trusses etc. are necessary like in deep raft etc. and have been detailed in the drawing, any welding necessary for fabrication of such trusses chair etc. is deemed to have been covered under the rates for reinforcement and such spacer, chairs, trusses etc. shall be measured and paid under the relevant reinforcement item. If any steel plates are used as gussets in fabrication of these chairs, trusses the same shall be payable under insert item.

J) CONTROL:

a) The placing of reinforcements shall be completed well in advance of concrete pouring. Immediately before pouring, the reinforcement shall be examined by the Engineer for accuracy of placement and cleanliness. Necessary corrections as directed by him shall be carried out. Laps and anchorage lengths of reinforcing bars shall be in accordance with IS:456, unless otherwise specified. If the bars in a lap are not of the same diameter, the smaller will guide the lap length. The laps shall be staggered as far as practicable and as directed by the Engineer and not more than 50% of the bars shall be lapped at a particular section. Arrangements for placing concrete shall be such that reinforcement in position does not have to bear extra load and get disturbed.

b) COVERS FOR REINFORCEMENT**:**

The cover for concrete over the reinforcements shall be as shown on the approved drawings unless other wise directed by the Engineer. Care should be taken to ensure that projecting ends of ties and other embedded metal do not encroach into the concrete cover. Where concrete blocks are used for ensuring the cover and positioning reinforcement, they shall be made of mortar not leaner than 1 (one) part cement to 2 (two) parts sand by volume and cured in a pond for at least 14 (fourteen) days. The type, shape, size and location of the concrete blocks shall be as approved by the Engineer. Their strength shall correspond to the strength of concrete proposed for the structure. Where such cover blocks are used, all cover, spacers shall be secured firmly so that they are not disturbed during vibration.

c) TOLERANCES:

Unless otherwise specified by the Engineer‑in‑charge, reinforcement shall be placed within the following tolerances as specified in Clause 11.3 of IS: 456‑2000:

* + 1. For effective depth 200 mm or less + 10 mm

(b) For effective depth more that 200 mm + 15 mm

The cover shall in no case be reduced by more than one third of specified cover or 5 mm whichever is less.

K) STORAGE:

‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑

Storage Place of storing Remarks

‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑

A. Cement to be stored in a place of Test of compression

easy access for proper inspection strength should be

and identification. It should be done by the project

placed in a weather-proof building, authorities and result

so that loss due to dampness should be intimated to

and other causes and is minimum. the contractor from

time to time.

B. Reinforcement Reinforcement procured by the Steel shall not contain

bidder are to be stored diameter- contain excess rust or cracks

wise in such a place to permit etc.

easy identification. The area should

be such that water does not accumulate

and reinforcement do not get distorted.

It should not be stacked directly

over Ground or near any harmful

materials. It should be cleaned of

excessive rust before use.

‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑

L) Acceptance Criteria:

Reinforcements shall be checked for cleanliness, proper bending, binding, placing and securing in position with provision for proper cover.

M) Method of Measurements:

a) Bar or any other type of reinforcement used like hard drawn steel wire fabric etc. for reinforced concrete shall be measured by weight in tonnes. The weight shall be arrived at by multiplying the actual or theoretical length measured along standard hooks, cranks, bends, authorized laps etc. whichever is less by the sectional weights. Claims if any for payment for this item shall be submitted with supporting document giving the schedule of bars with sketches. **The sectional weight to be adopted shall be IS Sectional weight.**

b) Standard hooks, cranks, bends, authorized laps etc. shall be measured.

c) Separator pieces between two or more layers of steel shall not be measured.

d) No payment shall be made for lap welding or butt welding if permitted, Supports, chairs, hangers, etc. of height 300 mm and less, required for keeping the steel in position unless otherwise specified in the contact. For supporting horizontal reinforcement at heights larger than 300 mm, support drawings shall be prepared by the contractor and payment shall be made for the supports as approved by the Engineer‑in‑charge, or as actually placed, whichever is less, at the same rate as for reinforcement.

e) No extra payment will be paid for modification of already embedded reinforcement, if required due to faulty fabrication or placement.

f) Dowels neither shown in the drawings nor instructed by the Engineer‑in‑charge, but required for construction facilities and/or sequences, shall not be measured.

**10.0 TECHNICAL SPECIFICATION FOR FORMWORK:**

10.1.0. The section of the specification covers the technical requirements for furnishing form work/shuttering for plain & reinforcement concrete works for all structures all levels including buildings, foundations, trenches, tunnels, rail tracks, water storage tanks etc. as required for complete job, as per approved construction drawings under this contract.

10.1.1 If it is so desired by the Engineer‑in‑charge, the contractor shall prepare, before commencement of the actual work, design and drawings for formwork and centering and get them approved by the Engineer‑in‑ charge. The formwork shall conform to the shape, lines and dimensions as shown on the drawings.

10.1.2 Materials used for the form work inclusive of the supports and centering shall be capable of withstanding the working load and remain undistorted throughout the period it is left in service.

10.1.3 Formwork shall be composed of steel and/or best quality shuttering wood of non‑absorbent type. Timber shall be free from significant knots and shall be of medium grain as far as possible and hard woods shall be used as caps and wedges under or over posts. Plywood or equivalent shall be used where specified to obtain smooth surfaces, for exposed, concrete work. Struts shall generally be mild steel tubes, and strong Sal ball is 150 mm in diameter or above. Bamboos, small diameter balls, etc. shall not be used unless approved by the Engineer‑in‑charge in specific cases.

10.1.4 Supports or props should not bear on an unproved lower suspended floor or beam unless calculations are submitted to the Engineer‑in‑charge to confirm the strength of the lower floor or beam and no propping shall be taken out until the Engineer‑in‑charge's approval has been given.

10.1.5 The centering shall be true and rigid and thoroughly braced both horizontally and diagonally. The forms shall be sufficiently strong to carry without undue deformation, the dead weight of the concrete as a liquid as well as working load.

Where the concrete is vibrated, the form work shall be strong enough to withstand the effects of vibration, without appreciable deflection, bulging, distortion or loosening of its components. The joints in the formwork shall be sufficiently tight to prevent any leakage or mortar. The formwork shall be such as to ensure a smooth uniform surface free form honeycombs, air bubbles, bulges, fins and other blemishes. Any blemish or defect founding the surface of the concrete must be brought to the notice of the Engineer‑in‑ charge immediately and rectified free of charge as directed by him. To achieve the desired rigidity, the bolts, space blocks, the wires and clamps as approved by the Engineer‑in‑charge shall be used but they must in no way impair the strength of concrete or leave stains or marks on the finished surface. Where there are chances of these fixtures being embedded, only mild steel or concrete of adequate strength shall be used. Bolts passing completely through liquid retaining walls/slabs or the purpose of securing and aligning the formwork should not be used.

10.1.6 For exposed interior and exterior concrete surfaces of beams, columns and walls, plywood or other approved forms, thoroughly cleaned and tied together with approved corrosion‑resistant devices shall be used. Rigid care shall be exercised in ensuring that all columns are plumb and true and thoroughly cross-braced to keep them so. All floor and beam centering shall be crowned not less than 8 mm in all directions for every 5 meters span. Unless described on the drawing or elsewhere to the contrary, beveled strips 25 mm shall be provided, without any extra charge, to form angles and in corners of columns and beam boxes for chamfering of corners. Temporary openings for cleaning, inspection and for pouring concrete shall be provided at the base of vertical forms and at other places, where they are necessary and as may be directed by the Engineer‑in‑charge. The temporary openings shall be so formed that they can be conveniently closed when required and must not leave any mark on the concrete.

10.1.7 All horizontal forms shall be constructed for pressures from the dead weight of concrete and embedment and a minimum live load of 200 Kg/Sq.m.

10.1.8 All details of formwork, placing, tying etc. shall be subject to the approval of the Engineer and the contractor shall submit drawings, when requested, showing details of form construction. The contractor shall be responsible for the adequacy of the formwork to withstand the pressure of freshly placed concrete or other loads imposed without failure, movement or deflections of the component parts.

10.2.1.Cleaning & Treatment of Forms:

All parts of the forms shall be thoroughly cleaned of old concrete, wood shavings, saw dust, dirt and dust sticking to them before they are fixed in position. All rubbish, loose concrete, chippings, shavings, sawdust etc. shall be scrupulously removed from the interior of the forms before concrete is poured. Compressed air jet and/or water jet along with wire brushes, brooms etc. shall be used for cleaning.

The inside surface of the formwork shall be treated with approved non‑staining oil or other compound before it is placed in position. Care shall be taken that oil or other compound does not come in contact with reinforcing steel or construction joint surfaces and shall be non‑staining and non‑ injurious to concrete. They shall not be allowed to accumulate at the bottom of the formwork. The oiling of the formwork will be inspected just prior to placement of concrete and redone wherever necessary.

10.2.2. Design:

The formwork shall so designed and erected that the forms for slabs and the sides of beams, columns and walls are independent of the soffits of beams and can be removed without any strain to the concrete already placed or affecting the remaining formwork. Removing any props or re-propping shall not be done except with the specific approval of the Engineer and props can be reinstated in anticipation of abnormal conditions. If formwork for column is erected for the full height of the column, one side shall be left open and built up in sections, as placing of concrete progress. Wedges, spacer bolts, clamps or other suitable means shall be provided to allow accurate adjustment and alignment of the formwork and to allow it to be removed gradually without jarring the concrete.

10.2.3.Tie Rods:

Metal tie rods shall be used for supporting all forms. Provision shall be made for removal of a section of each rod at surface of the concrete to a depth of approximately 50 mm. All holes left by the removal of hital huts of other removal fixture embedded in the face of the concrete shall be filled and finished with cement in a manner specified in the section of "Finishing", threaded inserts embedded on of the wall shall be used for attaching the forms to previously plated concrete.

10.2.4.Tie Wires:

Wire ties will be permitted only upon approval at the Engineer‑in‑charge and when permitted, shall be cut off flush with the face of the concrete, or countier sunk, filled and finished, as required by the Engineer‑in‑charge in the manner specified under the Sections of "Finishing".

10.2.5 Chamfers and fillets:

All corners and angles shall be formed with 45' mouldings to form chamfers or fillets on the finished concrete. The standard dimensions of chamfer and fillets, unless otherwise detailed or specified shall be 25 x 50 mm. Care shall be exercised to ensure accurate mouldings. The diagonal face of the moulding shall be planned or surfaced to the same texture as the forms to which it is attached. Unit rates quoted shall include providing the chamfers as specified or as shown on the drawings.

10.2.6 Construction joint chamfers:

Vertical construction joints on faces that will be exposed at the completion of the project, shall be chamfered as above except where not permitted by the Engineer‑in‑charge.

10.2.7 Joints:

Joints in forms shall be horizontal or vertical unless otherwise specified and shall be sufficiently tight to prevent any leakage. Suitable devices shall be used to hold adjacent edges together in accurate alignment. All forms shall be such that they can be removed without hammering or plying against the concrete.

Inspection of Forms:

Casting of concrete shall start only after the formwork has been inspected and approved by the Engineer. The concreting shall start as early as possible within 3 (three) days after the approval of the formwork and during this period the formwork shall be kept under constant vigilance against any interference. In case of delay beyond three days, a fresh approval from the Engineer shall be obtained.

10.3.1 Removal of Forms:

Before removing any formwork, the Contractor must notify the Engineer well

in advance to enable him to inspect the concrete if he so desires. The Contractor shall begin the removal of formwork only after approval of Engineer‑in‑charge. He shall place on record the date on which the concrete is placed in different parts of the work and the date of theremoval of formwork there from. This record shall be checked and counter‑signed by theEngineer‑in‑ charge. The contractor shall be responsible for the safe removal of formwork but the Engineer‑in‑charge may delay the time of removal if he considers it necessary. Any workshowing signs of damage through premature removal of formwork

or loading shall be entirely reconstructed without any extra cost to Owner. Forms for various types of structuralcomponents shall not be removed before the minimum periods specified, which shall also be subject to the approval of the Engineer‑in‑charge.However, in any case, formwork shall not be struck until the concrete has reached a strength at least twice the stress to which the concrete may be subjected to at the time of removal of forms.

10.3.2. The number of props left under their sizes and disposition shall be such as to be able to safely carry the full dead load of the slab beam or arch as the case may be together with any live load likely to occur during curing or further construction.

10.3.3. Where the shape of the element is such that the formwork has reentrance angles, the form work shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.

10.3.4. In case of cantilever slabs the removal of forms shall begin from outer edge towards support where as in case of slabs on four sides the removal of forms shall begin from center to supports.

10.4 Tolerance for the finished concrete:

10.4.1 The formwork shall be so made as to produce a finished concrete true to shapes, lines, plumb and dimensions .Tolerances limit specified under Clause 10 of IS: 456‑2000 shall be followed where so desired by the Engineer‑in‑charge. The Engineer‑in‑charge may call for finished work at any time to set standards of workmanship. Once approved these will become the acceptance sample.

The tolerance given above are specified for local aberrations in the finished concrete surface and should not be taken as tolerances for entire structure taken as a whole or for the setting and alignment of formwork, which should be as accurate as possible and true to shape required to the entire satisfaction of the Engineer‑in‑charge. Any error within the above tolerance limits or any other as may be specially set up by the Engineer‑in‑charge, if noticed in any lift of the structure after stripping of forms, shall be corrected in the subsequent work to bring back the surface of the structure to its true alignment.

1.50 Reuse of Forms:

103.5.1Formwork may be reused, provided that it is true, un-warped, thoroughly clean and without broken or damaged edges and equal in use in every respect to a new lumber. All form lumber shall have the contact surfaces re-oiled or recoated with an approved composition prior to usage.

10.5.2 Before reuse all forms shall be thoroughly scrapped, cleaned, joints etc. examined, and when necessary repaired, and inside surface treated as specified herein before. Formwork shall not be used/reused, if de-cleared unfit or unserviceable by the Engineer‑in‑charge.

10.6.0 Classification:

Generally, the 'ordinary' class formwork shall be used unless otherwise directed by the Engineer.

a) Ordinary These shall be used in places where ordinary surface finish is required and shall be composed of steel and/or approved good quality partially seasoned timber.

b) Plywood These shall be used in exposed surfaces, where a specially good

finish is required and shall be made of approved brand of heavy quality plywoodto produce a perfectly uniform and smooth surface conforming to the shape described in the drawing with required grain texture on the concrete. Reuse may only be permitted after special inspection and approval by the Engineer. He may also permit utilisation of used plywood for the 'ordinary' class, if it is still in good condition.

c) Ornamental These shall be used where ornamental and curved surface are required and shall be made of selected best quality well seasoned timbers or of plywood, which can be shaped correctly.

d) Shell roof For this item, the detailed design of formwork shall be submitted to the Engineer‑in‑charge, well in advance for his approval. Units of shell forms may be used repeatedly but prior approval shall be required for each repetition. Extra care shall be taken to keep correct levels and profiles.

Opening, chases, grooves, rebates, block outs etc. The Contractor shall leave all openings, grooves, chases, etc. in concrete work as shown on the drawings or as specified by the Engineer.

10.7.0Acceptance:

10.7.1 Finished concrete shall be true to shape, lines, levels, plumb and dimensions as shown on drawings.

10.7.2 All embedded fixtures shall be of correct type and in correct position as shown in drawings.

10.7.3 Finished concrete surfaces shall be free from blemishes like honey‑combs air bubbles, fins etc.

10.7.4 Exposed decorative concrete surface shall be free from rust stains, grease and mould oil etc. and shall have uniform pleasing appearance to the satisfaction of the Engineer‑in‑charge.

10.7.5 The finished concrete shall be of a standard at least equal to that of the accepted sample.

11.0 Aggregates for P.C.C / R.C.C works:

The aggregates required for Plain or reinforced cement concrete works should be obtained by machine crushing ,free from dust HBG of varying sizes with the composition given below for well graded metal.

12.0 Hold fasts & Bed blocks :

Hold fasts of doors and windows are to be provided in PCC(1:2:4) using 20 mm well graded HBG metal with the composition as given above . Bed blocks are to be provided in CC (1:2:4) using 20 mm well graded HBG metal.

The quoted rate shall include cost and conveyance of all materials, SEIGNORAGE labour charges, form work, curing with all leads and lifts etc., complete for finished item of work.

13.0 Cement:-

Cement shall be OPC/ PPC of 43 grade / 53 grade of make like RAASI, PRIYA, KCP, RAMCO, L&T, BIRLA or any other ISO company. Cement shall be procured by the contractor only.

i) All cement used for the work shall be ordinary Portland cement or such other cement as may be permitted by the Engineer-in-charge. Portland cement shall comply with the requirements of the latest issue of IS 269.

ii) Cement which has remained in bulk storage at the mill for more than 6 months, or which has remained in bags at the dealer's storage for over 3 months, or which has been stored at project site for more than 3 months shall be re-tested before use. Cement shall also be rejected if it fails to conform to any of the requirements of these specifications.

14.0 Reinforced cement concrete :

14.1 Sun Shades: Sun shades of 62.5mm average thickness are to be constructed in RCC (1:2:4) using 20mm well graded machine crushed HBG metal with the composition as given above.

14.2 Lintels: Lintels are to be casted in RCC(1:2:4) nominal mix using 20mm well graded HBG metal with the composition as given above.

14.3 Under reamed Piles, Columns, Beams, Roof slab, Balcony/Portico, Projection Slab :-

Under reemed Piles, Columns are to be laid with DESIGN MIX CONCRETE RCC M20 grade using 10 to 20mm well graded HBG metal.

Reinforced cement concrete 1:2:4  **for columns, Beams. Roof slab, Balcony/Portico, Projection Slab** using 10mm to 20mm size graded HBG machine crushed metal (50% each) from approved quarry giving cube crushing strength of 150 kg/sqm and a minimum of 330 Kgs of cement for 1 Cum of concrete including cost and conveyance charges of cement and all other materials to site, scaffolding charges, seigniorage charges, centering, shuttering, machine mixing, laying concrete, curing for specified number of days by curing with wet gunny bags, vibrating etc compaction by pan vibrator or needle vibrator supplemented by hand spreading , rodding and tamping , all incidental and operational charges, all leads and lifts and for all floors leaving gaps and pockets wherever required etc complete., but excluding cost of steel and its fabrication ,all incidental charges etc. complete for finished item of work as directed by the Engineer in charge.

Reinforced cement concrete 1:2:4 **columns, beams, roof slab** using 10mm to 20mm size graded HBG machine crushed metal (50% each) from approved quarry giving cube crushing strength of 150 kg/sqm and a minimum of 330 Kgs of cement for 1 Cum of concrete including cost and conveyance charges of cement and all other materials to site, scaffolding charges, seigniorage charges, centering, shuttering, machine mixing, laying concrete, curing for specified number of days by curing with wet gunny bags, vibrating etc compaction by pan vibrator or needle vibrator supplemented by hand spreading , rodding and tamping , all incidental and operational charges, all leads and lifts and for all floors leaving gaps and pockets wherever required etc complete., but excluding cost of steel and its fabrication ,all incidental charges etc. complete for finished item of work as directed by the Engineer in charge.

15.0 Concreting:-

**15.1 Composition**: Concrete shall be composed of cement, river sand also termed as/fine aggregate broken rock or coarse aggregate and water, all machine mixed and brought to proper consistency whenever so ordered by the Executive Engineer/ Civil/ Gr.Hyderbad, Admixtures shall be added as stated in the special conditions. The exact proportion of each type of aggregate listed in these specifications will be determined from time to time on the mechanical analysis of the aggregate stock piles and tests of resulting concrete test cubes, or cylinders. In general, the design mix proportions be adjusted to produce a durable plastic and workable concrete suitable for the specific conditions of placement and design strength. The specifications for the cement, sand, coarse aggregate and water have been detailed in Technical specifications. (IN situ mix test for cement ,aggregates shall conducted for cement concrete exceeding 100 cum or 17 hours)

15.2 Concreting :- The contractor’s rate for various items of work shall include cost of materials, seignorage, conveyance, labour, leads & lifts etc. complete. Concreting work, reinforcements, shuttering including curing etc. should generally conform to the relevant specifications as per ISI except for deviation if any hereunder. The strength requirements of concrete proposed to be used for various items of work mentioned in the bill of quantities shall be as follows.

**Table**

---------------------------------------------------------------------------------------------

Compressive Works test strength in N/sq.mm on 150 mm cubes

after testing conducted in accordance with IS :517 Grade of

------------------------------------------------------------------------------------------------

Concrete Min. at 7 days Min. at 28 days

------------------------------------------------------------------------------------------------

M 10 7.0 10

M 15 10.0 15

M 20 13.5 20

M 25 17.0 25

M 30 20.0 30

M 35 23.5 35

M 40 27.0 40

M 45 30.0 45

M 50 33.5 50

------------------------------------------------------------------------------------------------

Note: Cylinder strength.

Where compressive strength tests of cylinders are adopted the compressive strength given above for cubes shall be modified according to the formulae.

Maximum cylinder compressive strength } 0.8 x compressive strength specified

required } for 15cm cubes.

The approximate quantities of materials in dry conditions required for obtaining M20 grade concrete for 1 cum are as follows:

---------------------------------------------------------------------------------------------------------

Sl.No. Grade of concrete Sand in Cum Coarse aggregate Min cement

in cum. per 1cum

of concrete.

---------------------------------------------------------------------------------------------------------

1. M20 0.46 0.92 330 Kgs.

2 M25 0.46 0.92 360 Kgs.

---------------------------------------------------------------------------------------------------------

Any deviation in cement content (increase) from those specified in the above table over that required as per design mix shall be to the account of Board. No extra payment or deduction shall be made for variation in several ingredients except the cement content.

15.3 Sampling.:- Sampling of fine and coarse aggregate and cement will be done periodically in accordance with standard practice/ cement concrete exceeding 100 cum or 17 hours, and tests made under the supervision of the quality control Engineer. Also the routine tests shall be made in various stages of batching Operation section for which the contractor shall provide all facilities necessary for procurement of representative samples for which no payment shall be made.

15.4 Slump tests.:- All slump tests be made in accordance with recommended procedure given IS code 1199-1959 for reinforced concrete (setout Granville and Thomas or in designation C.148,52 of the American society of testing materials. The slump preferred to, shall be determined when the concrete is about to be deposited as such less slumps within the limits will be required as may, in the opinion of the Executive Engineer/ Civil/ Gr.Hyderbad , be practicable to produce concrete of better quality and of greater economy. Greater slump (but in all cases limited to 6” (15cm) maximum than those specified in the table) will be permitted in exceptional cases, wherein the opinion of the Executive Engineer/ Civil/ Gr.Hyderbad , internal vibration of the concrete is not practicable and where especially authorize by the Executive Engineer/ Civil/ Gr.Hyderbad for concrete in position, specially difficult for placement as in thin or heavily reinforced section.

15.5 Strength:- The required strength mentioned in the table are minimum crushing strength of ‘work test’ cylinders that must be obtained on cylinders made from concrete, either at the batching plant or at the placing point, and standard cured. The 28 days strength is the average strength of 3 test specimen taken from a single batch provided that not more than 10% of specimens tested shall have strength less than 80% of the required strength. The average strength of all tests for a given period shall equal or exceed the required strength. If the average crushing strength is higher, the contractor shall not be entitled to any increase in payment of work on account of the actual strength being above the minimum specified. In addition to the 28 days strength tests, the Executive Engineer/ Civil/ Gr.Hyderbad may at his discretion make 7 days strength tests. The minimum 7 days strength realized will not normally be less than 2/GROUND of the minimum 28days strength specified. The exact relation will be fixed on the site after studying the actual values realized. If at any time, the 7 days strength indicate that the strength of 28 days may not be achieved, as specified the Executive Engineer/ Civil/ Gr.Hyderbad shall have the authority to suspend concreting operations, until the reasons have been investigates and corrected and/or the mix has been redesigned etc and the contractor shall comply herewith without such suspension being made a reason for any claim.

The concrete for testing shall be collected as it comes out of the mixer once or more often as the Executive Engineer/ Civil/ Gr.Hyderbad may direct, and in quantity sufficient to prepare at least 3 test pieces from each sample. The compressive strength of concrete shall be determined through the medium of tests of (15x30cm) cylinders. If cylinders are made they shall be made and cured in accordance with American society of testing materials, designation C.31-40 and tested in accordance with designation c.31-49. Cylinders 6” by 12” will be used for concrete made from aggregate and smaller.

In addition to the strength tests carried above it is contemplated that the tests on actual cores from the concrete laid in position shall be made, and results thereof shall not be in any case lower than those of the test pieces. If the cores taken out show unreasonably low results the work is liable to be rejected and may be required to be dismantled and redone with all consequences to the contractor. The tests shall be carried out by the TGSPDCL at its own cost and as directed by the Executive Engineer/ Civil/ Gr.Hyderbad and the contractor shall afford all reasonable facilities for taking the test cores.

The contractor shall also arrange to fill the test holes left by the removal of the cores with concrete of the required strength without any extra payment and to the satisfaction of the Executive Engineer/ Civil/ Gr.Hyderbad .

The contractor shall at all times have access to and associate with sampling, design and tests of trial mixes, tests of strengths and similar other Operations. It shall then be the contractor’s responsibility to rebooting on the works, concrete of quality, density and strength corresponding to the laboratory and test designs.

The laboratory mix will be so designed that the minimum strength achieved on the laboratory test cylinder is about 25% higher than that specified above that concrete has a density of (155lbs) per cubic ft or more (2486 kg/m3) and as impermeable as can be made. The same mix shall be used in the field to assure the achievement of quality specified.

Failure on the part of the contractor to associate with the Operations aforesaid shall not absolve him of the responsibility of producing on the works concrete of specified quality, density and strength with design mixes determined from laboratory tests and results.

15.6 Water cement Ratio:- The water cement ration will be regulated by the requirements of workability and design, but in general will not exceed 0.60 by weight, exclusive of water absorbed by the aggregates. The amount of water shall be adjusted for any variation in the moisture content or the grading of the aggregate as they enter the mixer in any batch and shall not be more than the minimum necessary to produce concrete of the required consistency after making period specified in general or from time to time. Uniformity shall be maintained in the consistency of concrete from batch to batch.

15.7 Proportioning of concrete:- The exact proportions in which the different gradients are to be used from the different parts, of the work shall be determined by the contractor in any one of the recognized laboratories under the supervision of the departmental staff after trial mixes, the structural concrete is to be commenced only after establishing the cement in each grade of mix as per IS 456. The cost on account of laboratory test shall be to the account of the contractor.

15.8 Cement content:-The cement content is specified as the specific weight of cement used in the manufacture on 1 cum of concrete as measured in the finished work after vibration, consolidation, setting and curing. The actual volume of different gradients that would go in. in a batch of concrete to produce the specified volumetric unit shall be determined by tests and the cement content specified shall be put in for each batch supposed to produce the same unit of concrete in place is determined by the tests.

Any variation in the cement content shall also be similarly treated. No extra payment or deductions shall be made for variations in the several in-gradients except in cement content, which shall be adjusted as described. Variations in proportions of crushed metal and natural sand will not be considered for purposes of price variation.

If for any reasons it is found necessary to resort to volumetric batching instead of weigh batching which shall be subject to the specific approval of the Executive Engineer/ Civil/ Gr.Hyderbad . The proportion of cement (by volume) to that of the various aggregates also by volume shall be so adjusted that the cement content in the specific volumetric unit of finished concrete, shall not be less than that specified for the relevant class of concrete. For this purpose one bag of cement as supplied by cement manufactures shall be taken as 1.225 cft or 50 kgs.

15.9 Variation in Cement content:- The unit rate accepted for concrete shall be adjusted to account for the increase in the quantity of cement actually designed and specified (if different from that specified in the specifications) at the same issue rate per tonne of cement i.e 2400/- per MT. The variation in the quantities of other aggregates shall not be considered as justification for price adjustment. The proportions of cement as that in the mix shall be related to the volume of the finished concrete.

15.10 Admixtures:- The Executive Engineer/ Civil/ Gr.Hyderbad shall have the authority at any time, and from time to time to order the addition of any air entraining agent or other admixtures, to any mix of concrete in such proportion or quantity or mode, as he may specify and the contractor shall comply with the same. The admixtures shall be supplied by department free of cost for the purpose of the concrete or the motor as the case may be. The resulting modifications, if any to the content or proportion of cement as a consequence thereof, shall be accounted for in the rates for payment according to para 13.9 herein above.

The Executive Engineer/ Civil/ Gr.Hyderbad shall have the authority to arrange for the supply of the admixtures or admixtures aforesaid, through the contractor (by mutual agreement) or by other agency, as the Executive Engineer/ Civil/ Gr.Hyderbad may deem fit. Should the mixing entail any additional expenditure to the contractor by way of additional plant, equipment, or operation, the same shall be paid for at actual cost, as may be determined by the Executive Engineer/ Civil/ Gr.Hyderbad whose decision shall be final and binding upon the contractor.

The contractor shall not, without the written consent of the Executive Engineer/ Civil/ Gr.Hyderbad , add any admixtures, to any mix of concrete and whenever such an admixtures is permitted, the Executive Engineer/ Civil/ Gr.Hyderbad shall determine the adjustment in price if any, that should be made in consequence. The decision of the Executive Engineer/ Civil/ Gr.Hyderbad shall be final an binding on the contractor.

15.11 Handling of aggregate :-The contractor shall at all times, maintain a live storage of all grades of aggregates of at least one week’s requirement of work.

15.12 Batching equipment:- The batching plant shall be of the requisite capacity to maintain the specified progress on different items of work.

15.13 Check tests for equipment’s:- The tests shall be made in the presence of TGSPDCL representatives and shall be adequate to prove the accuracy of the measuring devices. Unless otherwise directed, tests shall be made once in two weeks in the case of all other scales. The contractor shall make such adjustments, repairs or replacements s may be necessary to meet the specified requirements for accuracy of measurements.

Detailed drawings showing reinforcement details will be supplied by the department during the course of execution. The top of roof slab of last floor is Provided with **Impervious coat over exposed RCC Roof slab surfaces** to required slopes with Polymer Acrylic Water Proofing layer of approved make as per manufacturer's specifications and over the layer 25 mm average thickness of screed cement concrete in CC 1:2:4 using 6 mm coarse aggregate with mixing of integral water proofing chemical at 150 ml per 50 kg of cement and over the screed concrete 4mm thick neat coat of cement plaster in CM 1:4 with mixing of integral water proofing chemical of approved make at 150 ml per 50 kg of cement and thread lining of regular intervals of 45 x 45 cms including and cost and conveyance of all materials, water, all labour charges, chemicals, curing for specified number of days, rounding off junctions of wall and slab, all leads, lifts, heights, levels and floors etc. complete as directed by the engineer-in-charge for finished item of work.

All materials shall conform to standard specification, IS and are to be approved by the Engineer-in-charge prior to their usage in the work. For this purpose, the contractor shall whenever called up to do so, furnish samples of materials in adequate quantities and carryout all tests on materials and concrete specimens. Testing shall be done in close liaison with Engineer-in-charge or his representative and methods of test shall conform to the relevant IS Specification. Test results also shall conform to the IS Specification. The cost of samples and testing shall be borne by the contractor.

No concrete work shall be done in the absence of the Engineer-in-charge. Before placing the concrete, the Engineer-in-charge shall have inspected and approved all reinforcement in place, form work, centering and scaffolding for concrete. At least 24 hours notice shall be given for this purpose.

All concrete works shall be machine mixed, vibrated for proper compacting unless otherwise specified by Engineer-in-charge.

Transportation and placing methods and adequacy of equipment and procedure shall be studied in advance. All form work, reinforcement steel and location and details of embedded parts etc. shall be checked and approved by the Engineer-in-charge. Construction joints shall be made at only those positions shown on the drawing or at locations approved by the Engineer-in-charge.

All sleeves, inserts, anchors and embedded items required for adjacent work or for its supports shall be placed prior to concreting. Care shall be taken not to displace reinforcement and embedded parts during the placing and compaction of concrete.

Curing of concrete shall start after 8 hours of placement, and in hot weather with in 4 hours of placement in exposed faces, and kept continuously wet preferably by continuous spraying of water after the final set for a period of at least 10 days from the date of casting.

If the temperature of atmosphere during the period has been continuously above 100 C, When the temperatures are higher, the Engineer may extend the curing period for a suitably longer period.

The quoted rate for concrete shall include the supply of materials, labour, tools and tackle, plant and equipment, scaffolding, staging, form work, centering and shuttering, curing, leads and lifts, other incidental charges etc. complete for finished item of work. The quoted rate shall also include, wherever applicable, the cost of placing, keeping in position any embedment or inserts, openings, joints etc., as shown in the drawings and as directed by the Engineer-in-charge. Reinforcement steel and its fabrication shall be paid separately. The quoted rate shall be excluding basic cost of cement, required cement will be issued at department stores at free of cost.

**15.14 Transport, Placing and Compaction of Concrete**

The method of transporting and placing concrete shall be approved by the Engineer-in-Charge. Concrete shall be transported and placed such that no contamination, segregation or loss of its constituent materials takes place.

No concrete shall be placed in any part of the structure until the approval of the Engineer-in-Charge has been obtained in writing.

If concreting is not started within 24 hours of the approval being given, it shall have to be obtained again from the Engineer-in-Charge. Concreting shall then proceed continuously over the area between construction joints. **Fresh concrete shall not be placed against concrete, which has been in position for more than 30 minutes unless a proper construction joint is formed.**

**Concrete when deposited shall have a temperature of not less than 4.5 dig C and not more than 38 dig. C unless otherwise specified.** It shall be compacted in its final position within 30 minutes of its discharge from the mixer unless carried on properly designed agitators, operating continuously, in which case this time shall be within 2 hours of the addition of cement to the mix and within 30. Except where otherwise agreed to by the Engineer-in-charge, concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 m when internal vibrators are used and not exceeding 0.30 m in all other cases.

Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 meters. When trucking or chutes are used, they shall be kept clean and used in such a way as to avoid segregation.

When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 15mm thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 15 mm layer of mortar bed shall freshly mixed and placed immediately before placing of new concrete.

` Where concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgment of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed, and then coated with neat cement Ground. The first layer of concrete to be placed on this surface shall not exceed 150mm in thickness, and shall be well rammed against old work, particular attention being given to corners and close spots.

All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators. Where vibrators cannot be used, an alternate scheme of compaction shall be approved by the Engineer-in-charge. Sufficient vibrators, in serviceable condition, shall be kept at site so that spare equipment is always available in the event of breakdowns.

The performance requirements of vibrators shall conform to relevant IS Codes. Vibration shall not be applied through reinforcement, and where vibrators of the immersion type are used contact with reinforcement and all inserts shall be avoided as far as practicable.

**15.15 Finishing**

**General**

Immediately after the removal of forms, all exposed bars or bolts passing through the reinforced cement concrete member and used for shuttering or any other purpose shall be cut inside the reinforced cement concrete member to a depth of at least 25mm below the surface of the concrete and the resulting holes be closed by cement mortar. All fins caused by form joints shall be broken. All cavities produced by the removal of the firm ties, all holes and depressions, honey-comb spots, broken edges or corners and all other defects shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces, which have been filled/pointed, shall be kept moist for a period of twenty-four hours. Any repair and rectification of defective work is to be undertaken and carried out as directed by the Engineer-in-Charged and the cost is to be borne by the CONTRACTOR.

If rock pockets/honey-combs, in the opinion of the Engineer-in-charge, are of such an extent or character as to effect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the affected portions of the structure.

All construction and expansion joints in the completed work shall be left carefully tooled and free from any mortar and concrete. Expansion joint filler shall be left exposed for its full length with clean and true edges.

Curing of the surface shall be continued for a period as approved by the consultants.

**15.16 Classes of Finishing**

The surface finishes for formed and unformed surfaces are classified and defined as below. Surface irregularities permitted for the various classes of finishes are termed either abrupt-or-gradual-. Fins or offsets caused by displaced or misplaced form sheeting, lining or form sections by loose knots in form timber or by otherwise defective from timber are considered abrupt irregularities. All other cases are described as gradual irregularities. Gradual irregularities will be measured with a template for equivalent for curved surfaces. The length of template for testing gradual irregularities on formed surfaces shall be 1.5 m in length, the permissible gradual irregularities being measured over this length of the template.

**15.17 Finish for foundations and plinth**

Class F2 Finish shall be obtained by the use of properly designed forms, either close jointed wrought timber forms or with forms having plywood or steel sheet lining. The abrupt irregularities shall not exceed 5mm and gradual irregularities shall be less than 8mm. Small blemishes caused by entrapped air or water may be permitted but the surface shall be generally free from honeycombing, voids and large blemishes. Surface irregularities in excess of those stipulated shall be removed by clipping or rubbing abrasive stone.

**15.18 Class F3 Finish**

Class F3 finish shall be formed by specially designed clothes jointed rigid forms having lining of high quality form plywood. The surface irregularities shall be limited to nil for abrupt irregularities and 3mm for gradual irregularities. Class F3 finish may be obtained form class F2 finish by carefully removing all abrupt irregularities including fins and projections by rubbing/grinding.

**15.19 Finish for floor slabs**

This is the screeded finish used on surfaces over which other finishes such as wearing coats etc. are to be placed. It is also the first step in the formation of U2 and U3 finishes. The finishing operation consists of leveling and screeding the concrete to produce an even and uniform surface so that the gradual irregularities are not greater than 6mm.

Surplus concrete should be removed immediately after consolidation by striking it of with a sawing motion of a straight edge or template across a wooden or metal strip that has been set as a guide. Unless the drawings specify a horizontal surface or show the slope required, the tops of narrow surfaces, such as stair treads, walls, curbs and parapets shall be sloped approximately 10mm per 300 mm width. Surfaces to be covered with concrete topping, terrazzo, and similar surfaces shall be smooth screeded and leveled to produce even surfaces, irregularities not exceeding 6mm.

**15.20 Construction Joints:**

Concreting shall be carried out continuously up to the construction joints, the position and details of which shall be as shown on approved drawings or as directed by the Engineer-in-charge. Such joints shall, however, be kept to the minimum. For vertical construction joint, a stopping board shall be fixed previously at the pre-determined position and shall be properly stayed for sufficient lateral rigidity to pack against it. Concreting shall be continued right upto the board. The board shall not be removed before the expiry of the specified period for removal of vertical forms. Before resuming work at the construction joint where the concrete has not yet fully hardened, all laitance shall be removed thoroughly. Care being taken to avoid dislodgement of coarse aggregates. When work has to be resumed on a surface, which has hardened, the surface shall be thoroughly hacked, swept clean, wetted and covered with a layer of neat cement grout.

The neat cement grout shall be followed by a 15mm thick layer of mortar mixed in the same proportion as in the concrete and concreting resumed immediately thereafter. The first batch of concrete shall be rammed against the old work to avoid formation of any stone pockets, particular attention being paid to corners and close spots.

In all cases, the position and detailed arrangement of all construction joints shall be predetermined and got approved by the Engineer-in-charge

**15.21 Tests and Standards of Acceptance**

**15.22 Preliminary Tests for Designing Concrete**

For designing concrete preliminary tests referred to in paras 2.0 and 3.0 shall consist of three sets of separate tests, and in each set, tests shall be conducted on six specimens. Not more than one set of six specimens shall be made on any particular day. Of the six specimens in each set, three shall be tested at seven days and the remaining three at 28 days. The preliminary tests of 7 days are intended only to indicate the strength likely to be attained at 28 days.

**15.23 Work strength Tests for design concrete mix**

Works strength tests shall be made in accordance with IS 517. Each test shall be conducted on ten specimens, five of which shall be tested at seven days and the remaining five at 28 days. The cubes shall be made at the rate of one set for every 50 cum., the number of cubes can be reduced to six with the specific permission of the Engineer-in-charge.

Similar works tests shall be carried out whenever the quality and grading of materials is changed irrespective of the quantity of concrete poured. The number of specimens may be suitably increased as deemed necessary by Engineer-in-charge, when procedure of test given above reveals a poor quality of concrete and in other special cases.

All work shall be carried out under the supervision of a qualified and a competent Engineer who will supervise proportioning, placing and compacting of concrete at all stages.

All necessary labour, materials, equipment, etc., for sampling, preparing test cubes, curing etc., shall be provided by the CONTRACTOR. Testing of the materials and concrete may be arranged by the Engineer-in-charge in an approved laboratory at the cost of the CONTRACTOR.

**15.24** **Standard of Acceptance**

The average strength of the group of cubes cast for each day shall not be less than the specified works cube strength. 20 percent of the cubes cast for each day may have values less than the specified strength, provided the lowest value is not less than 85 per cent of specified strength.

**15.25 Manufacturer’s Certification: Testing Results etc.**

For all materials required for concrete construction including cement, aggregate, water, reinforcement the original copies of test certificates, test results etc., either carried out by the manufacturers or any other agency, the mix design recommendations etc. shall be submitted to Engineer-in-charge for his approval and record which shall remain the property of the owners.

**15.26 Chloride contents**

Since the chloride contents of the constituent materials of the concrete would be additive, it is desirable to keep a check on the overall chloride content of the concrete to keep it minimal. The cost of the testing for chloride content of the ingredients of concrete and of undertaking remedial measures if the chloride content is more than the permissible limit shall be borne by the CONTRACTOR.

Surface of prepared voids shall be wetted for 24 hours immediately before the patching material is placed. Repair of concrete shall be made by skilled workmen. Repairs shall be made as soon as practicable after removal of forms and in a manner to meet the requirements for the finish specified for particular location.

For repair of the concrete works, the CONTRACTOR may use epoxy of approved agency as a bonding agent prior to placing fresh concrete. The use or otherwise of epoxy for the repair work will be at discretion of the Engineer-in-charge. Epoxies shall be applied in strict accordance with the instructions of the manufacturer.

Epoxy is a two packed or three packed system containing base and hardener/s. The shelf life of the unmixed cans is about one year or more when stored in a place where ambient temperature does not increase beyond 24 degrees centigrade. The base and hardener/s shall be mixed in correct proportions recommended by the manufacturer. The blend after mixing intimately shall have a pot life of one hour and the material shall be applied over the old concrete to form a thin film. Fresh concrete shall be deposited immediately prior to the film drying up so as to ensure proper bonding between both concretes.

Where the dry pack method is used, holes shall be sharp and square at surface edges, but corners within holes shall be rounded. The perimeter of the hole shall be under-cut in several places. Holes for dry pack shall have a minimum depth of 25 mm. The holes to be repaired shall be scrupulously clean and slightly wet with no free water on the surface. The surface shall be then dusted slightly with cement by means of dry brush. Under no conditions shall the holes be painted with neat cement grout.

The dry pack mix shall be proportioned by weight: 1 part cement to 2.5 parts of sand that will pass a No.17 screen. Only enough water shall be used to produce a mortar which will stick together when moulded into a ball by a slight will stick together when moulded into a ball by a slight pressure of hands and will not extrude water but will leave the hands just damp. Dry pack material shall be placed and packed in layers having a compacted thickness of about 10mm. Each layer shall be solidly compacted over its entire surface by use of hardwood stick and hammer. The stick is normally about 300mm to 460mm long and not over 30mm in diameter. Most of the tamping should be directed at a slight angle and towards the side of the hole to assure maximum compaction and bond. Water shall not be used to facilitate finishing.

Filling materials used in repair of surfaces which will be exposed after completion of the project shall be made with cement from the same source as that used in concrete and blended with sufficient amount of white portland cement to produce the same colour as in adjoining concrete. Patched surface shall be given a final treatment of the patch to match that of the surrounding material.

Immediately after patching is completed, the patched area shall be covered with approved nonstaining, water-Saturated material and shall be kept wet and protected against sun and wind for a period of 12 hours. Thereafter, the patched area shall be kept continuously wet by a fine spray or sprinkling of water for not less than 10 days as required under section 9.1 and 11.1 of this specification. The layers of unite may be reinforced with steel mesh if directed by the Engineer-in-charge.

The extent of repair shall be decided upon by the Engineer-in-charge. The cost of repairs of defective areas shall be borne by the CONTRACTOR. The Engineer-in-charge may adopt at his discretion any other method of repairing like grouting with cement grout, epoxy grout or guniting etc., which will be carried out by the CONTRACTOR at his cost as per the specifications supplied by the Engineer-in-charge.

**15.27 SAMPLING & TESTING :**

1 General

The contractor shall carry out all sampling and testing in accordance with the relevant Indian Standards and as supplemented herein for the following items at his own cost unless otherwise specified in this specification. The Contractor shall get the specimens tested in a laboratory approved by the Engineer and submit to the Engineer the test results in triplicate within 3 (three) days after completion of the test.

2 Aggregate

The Contractor shall carry out any or all the tests aggregates as may be required by the Engineer in accordance with IS:2386 Parts‑I to VIII. The acceptance criteria of the samples tested shall be in accordance with the requirements of the relevant Indian Standards.

3 Water

Sampling and Testing of water being used for concrete works as per IS:3550 will be carried out by the Contractor at regular intervals and whenever directed by the Engineer. The final acceptance criteria in case of doubt will be as per IS:3025 & IS:456.

4 Admixture

5 a) Air Entraining Agents

Initially, before starting to use A.E.A., relationship between the percentage of air entrained and the cylinder cube crushing strength vis-à-vis quantity of A.E.A. used for all types of concrete will be established by the Contractor free of charge by carrying out sufficiently large number of tests. After that, at regular intervals and whenever directed by the Engineer, the Contractor will check up free of charge, the actual percentages of air entrained and corresponding crushing strengths to correlate with the earlier test results.

b) Other Admixtures

Tests for establishing the various properties of any other admixtures which may be required to be added shall be carried out by the Contractor free of charge to the Purchaser.

6 **Concrete**

The sampling of concrete, making the test specimens, curing and testing procedure etc. shall be in accordance with IS:517 and IS:1199 the size of specimen being 15 cm cubes. Normally, only compression tests shall be performed but under special circumstances the Engineer may require other tests to be performed in accordance with IS:517. Sampling procedure, frequency of sampling and test specimen shall conform to Clause 14 of IS:456. To control the consistency of concrete from every mixing plant, slump tests and/or compacting factor tests in accordance with IS:1199 and as mentioned in of this specification shall be carried out by the Contractor every two hours or as directed by the Engineer. Slumps corresponding to the test specimens shall be recorded for reference.

The acceptance criteria of concrete shall be in accordance with Clause 15 of IS:456. However, in exceptional circumstances, the Engineer may, at his discretion, accept a concrete of lower strength than specified and which is otherwise acceptable according to IS:456. Concrete work found unsuitable for acceptance shall have to be dismantled and replacement is to be done as per specification by the Contractor. No payment for the dismantled concrete, the relevant formwork and reinforcement, embedded fixtures, etc. wasted in the dismantled portion shall be made. In the course of dismantling, if any damage is done to the embedded items or adjacent structures, the same shall be made good, free of charge by the Contractor, to the satisfaction of the Engineer.

* 1. The Bar Bending Schedule with the necessary hooks, laps, spacers and chairs shall be 100% checked for all foundation concreting before start of work:
  2. Cutting tolerances for bars shall be as follows:

a) When the specified length is not = 25 mm

stated to be either maximum or +75 mm

minimum.

b) When the minimum length is specified + 75 mm

c) When the maximum length is specified = 50 mm

All the bent bars shall be checked as per approved Bar Bending Schedules, unless otherwise specified by the Engineer‑in‑charge, reinforcement shall be placed within the following tolerances:

Tolerance

a) For member with effective + 10 mm

depth 200 mm or less

b) For member with effective + 15 mm

depth more than 200 mm

The cover shall in no case be reduced by more than one third of specified cover or 5 mm whichever is less. Also, in no case shall the cover be increased by more than 10 mm.

All the joints and crossing of bars shall be checked to see that they are

tied properly with annealed wire as per specification.

Any of the bars selected for use shall be free from cracks, surface flows,

laminations and rough, jagged and imperfect edges.

After the reinforcement cage has been put in proper position and tied

with the main bars.

Tolerance in the foundation Blocks/Bolts for steel structures:

i) Along the depth + 5 mm

ii) Along the slope 1/1000

iii) Permissible deviation of anchor bolts (Plan view):

a) Located within the 5 mm

contour of column base

b) Located outside the 10 mm

contour of column base

iv) Permissible deviation in + 20 to 0 mm

level of anchor bolts

v) Deviation of anchor bolt + 30 to 0 mm

thread length.

**7 ACCEPTANCE CRITERIA:**

7.1 General:

The contractor shall carry out all sampling and testing in accordance with the relevant Indian Standards at his own cost, in a laboratory approved by the Engineer‑in‑charge, and submitting of the test.

7.2 Testing of concrete:

1. Normally, only compression tests shall be performed but the Engineer‑in‑charge may require other test to be performed in accordance with IS:517 (latest edition).
2. For each grade of concrete as follows:

‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑------------------------------------------------

Quantity of concrete Number of samples

in the work, cu.m.

‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑----------------------------------------------

* 1. 1
  2. 2
  3. 3
  4. 4

51 & above 4 plus one additional for each

additional 50 cu.m. part

thereof.

‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑-----------------------------------------------

However at least one sample shall be taken from each shift. At least 6 (six) specimens per sample shall be taken and 3 (three) of these shall be tested at 7 (seven) days and remaining at 28 days. Minimum compressive strength of 15 cm cubes of different grades of concrete at 7 days shall be as per table 5 of IS: 456‑2000

.

1. To control the consistency of the concrete from every mixing plant, slump tests and/compaction factor tests in accordance with IS:1199 shall be carried out by the contractor every two hours or as directed by the Engineer‑in‑charge. Slumps corresponding to the test specimens shall be recorded for reference. The Engineer‑in‑charge, at his discretion, may waive the above tests for small and unimportant concreting.
   1. ACCEPTANCE CRITERIA FOR CONCRETE
2. The acceptance criteria of concrete shall be in accordance with IS: 456 (latest edition).
3. Concrete work found unsuitable for acceptance shall have to be dismantled and replacement is to be done as per specification by the contractor. No payment shall be done for the dismantled concrete, the relevant formwork and reinforcement, embedded fixtures, etc. wasted in the dismantle. If any damage is done to the embedded items or adjacent structures, the same shall be made good, free of charge by contractor, to the satisfaction of Engineer‑in charge.
4. The dimensions of concrete as cast when compared with those on the drawing shall be within the tolerances given below; steps in surface alignment shall not exceed 2 mm.

No reduction will be permitted in the cover to reinforcement because of a specified negative tolerance in a concrete section.

STRUCTURAL ELEMENT PERMISSIBLE

DETAIL DEVIATION IN MM

Faces of concrete in foundations and +25 ‑5

structural members against which

backfill is placed

Exposed concrete in foundations +10 ‑5

Top surfaces of slabs and of concrete +10 ‑5

to received grouted plant or structural

steel work

Alignment of beams, columns, walls, + 5 ‑5

slabs & similar items.

Cross sectional dimensions of beams, + 5 ‑5

columns, walls, slabs and similar items.

Level and alignment of holding down + 5 ‑5

Bolts.

Level of holding‑down bolt assemblies +10 ‑5

Alignment of holding‑down bolt + 5 ‑5

Assemblies.

Centers of pockets or holes with greatest + 5 ‑5

lateral dimension not exceeding 150 mm.

Centers of pockets or holes with greatest +10 –5

lateral dimension exceeding 150 mm

Departure from alignment in roads and +15 ‑5

paved areas

Top surface of roads and paved areas + 5 ‑5

Plumb 1 in 1000 of height.

**7.4 Standard Deviation**

Standard deviation shall be based on test results and determination of Standard deviation shall conform to Clause 14.5 of IS:456.

**7.5 Inspection and Core Tests**

Inspection of concrete work immediately after stripping the formwork and core test of structures shall conform to Clause 17 of IS:456.

**7.6 Load Test**

Load Tests of structural members may be required by the Engineer, when the strength of test specimen results fall below the required strength, as per 'Load Test on Parts of Structures'. Clause 17.5 of IS:456. If load testing is decided by the Engineer, the member under consideration shall be subjected to a test load equal to 1.25 (one and a quarter) times the specified live load used for design and this load shall be maintained for a period of 24 (twenty four) hours before removal. The detailed procedure of the test is to be decided by the Engineer. Load tests shall not be made until the structure is at least 56 days old.

If the member shows evident failure, such changes as are necessary to make the structure adequately strong shall be made by the Contractor free of cost to the Owner. Alternatively, if permitted under Statutory Regulations and at the discretion of the Engineer, the structure under test or a portion thereof may be retained as such without any modification by derating its load bearing capacity, provided the design criteria allows such derating. A reinforced concrete beam, floor or roof shall be deemed to have passed the test if the maximum deflection at the end of 24 hours does not exceed the deflection given in Clause 17.5 of IS:456. The entire cost of load testing shall be borne by the Contractor. If a portion of the structure is found to be unacceptable, it shall be dismantled and replaced by a new structure as per specification. The entire cost of dismantling and replacement and restoration of the site being borne by the Contractor. If, in the course of dismantling, any damage is done to the embedded items and or other adjacent structures, the same will be made good, free of charge by the Contractor to the satisfaction of the Engineer.

7.7 LIST OF IS CODES AND STANDARDS FOR REFERENCE:

All work under this specification shall, unless specified otherwise, conform to the latest revisions and/or replacements of the following or any other Indian Standard Specifications and Codes of Practice. In case any particular aspect of work is not specifically covered by Indian Standard Specifications, any other standard practice, as may be specified by the Engineer, shall be followed:‑

IS:73 Indian Standard Specification for Paving Bitumen

IS:217 Indian Standard Specification for Coal Tar Pitch

IS:226 Indian Standard Specification for Structural Steel (Standard quality)

IS:269 Indian Standard Specification for Ordinary and Low Heat Portland Cement

IS:383 Indian Standard Specification for Coarse and Pine Aggregates from Natural Sources for concrete

IS:432 Indian Standard Specification for Mild Steel and Medium Tensile

Steel Bars and Hard Drawn Steel Wire for concrete reinforcement

IS:455 Indian Standard Specification for Slab Cement

IS:456 Indian Standard Code of Practice for Plain and reinforced concrete

IS:457 Indian Standard Code of Practice for general construction of plain

and reinforced concrete for Dams and other Massive Structures

IS:517 Indian Standard Specification for methods of test for strength of

Concrete

IS:1139 Indian Standard Specification for hot rolled mild steel and medium

tensile steel and high yield strength steel deformed bars for concrete

reinforcement

IS:1199 Indian Standard Specification for methods of sampling and analysis of

Concrete

IS:1200 Indian Standard Specification for method of Part‑II measurement

cement concrete works

IS:1200 Indian Standard Specification for method of Part‑V measurement of

Formwork

IS:1322 Indian Standard Specification for Bitumen Felts for waterproofing and

damp‑proofing

IS:1489 Indian Standard Specification for portland ‑ pozzolona cement

IS:1566 Indian Standard Specification for Methods of Sampling and analysis

of Concrete

IS:1709 Code of practice for laying damp‑proof treatment using bitumen felts

IS:1786 Indian Standard Specification for cold‑twisted steel bars for concrete

reinforcement

IS:1791 Indian Standard Specification for batch type concrete mixers

IS:2185 Indian Standard Specification for hollow cement concrete blocks

IS:2210 Indian Standard Specification for design of reinforced concrete shell

structures and folded plates

IS:2386 Indian Standard Specification for methods of test for aggregates for

concrete Part‑I to VIII

IS:2502 Indian Standard code of practice for bending and fixing of bars for

concrete reinforcement

IS:2505 Indian Standard Specification for concrete vibrators, immersion type

IS:2506 Indian Standard Specification for screed board concrete vibrators

IS:2514 Indian Standard Specification for concrete vibrating tables

IS:2722 Indian Standard Specification for portable swing weigh batchers for

concrete (Single and Double Bucket Type)

IS:2751 Code of Practice for welding of mild steel bars used for reinforced

concrete construction

IS:2770 Indian Standard Specification for method of testing bond on

reinforced Concrete

IS:3025 Indian Standard Specification for methods of sampling and test

(physical and chemical) for water used in industry

IS:3201 Indian Standard Specification for design and cocnstruction of precast

Concrete trusses

IS:3370 Indian Standard Specification for code of practice for concrete

structures for storage of liquids

IS:3550 Indian Standard Specification for method of test for routine control for

water used in industry

IS:3558 Code of Practice for use of immersion vibrators for consolidating

concrete

IS:3590 Indian Standard Specification for load bearing light weight concrete

blocks

IS:3696 Safety code for scaffolding and ladders

IS:3812 Indian Standard Specification for fly ash for use as admixture for

concrete

IS:4031 Indian Standard Specification for method of tests for hydraulic cement

IS:4082 Indian Standard Specification for recommendation on stacking and

storage of construction materials at site

IS:4090 Indian Standard Specification for design of reinforced cocncrete archs

IS:4634 Indian Standard Specification for method of testing performance of

batch‑type concrete mixes

IS:4656 Indian Standard Specification for form vibrators for concrete

IS:4925 Indian Standard Specification for concrete batching and mixing plant

IS:4926 Indian Standard Specification for ready mixed concrete

IS:4990 Indian Standard Specification for plywood for concrete shuttering

work

IS:4991 Indian Standard Specification for blast resistant design of structure for

explosion above Ground

IS:4995 Indian Standard Specification for design of Part‑I&II concrete bins for

the storage of granular and powdery materials

IS:4998 Indian Standard Specification for design of reinforced concrete

chimneys

IS:5512 Indian Standard Specification for flow table for use in tests of

hydraulic cement and pozzolanic materials

IS:5513 Indian Standad Specification for vicat apparatus

IS:5515 Indian Standard Specification for compaction factor apparatus

IS:5551 Indian Standard Specification for precast concrete coping blocks

IS:5817 Indian Standard Specification for method of test for splitting tensile

strength of concrete cylinders

IS:5891 Indian Standard Specification for hand operated concrete mixers

IS:6452 Indian Standard Specification for high alumina cement for structural

use

IS:6909 Indian Standard Specification for supersulphated cement

IS:6923 Indian Standard Specification for method of test for performance of

screed board concrete vibrators

IS:6925Indian Standard Specification for method of test for determination of

water soluble chloride in concrete admixtures

IS:7242 Indian Standard Specification for concrete spreaders

IS:7246 Indian Standard Specification for table vibrators for consolidating

concrete

IS:7251Indian Standard Specification for concrete finishers

IS:7320 Indian Standard Specification for concrete slump test apparatus

IS:7861 Indian Standard Specification for recommended Part‑I&II practice for

extreme weather concreting

IS:7969 Safety code for storage and handling of building materials

IS:8041E Indian Standard Specification for rapid hardening portland cement

IS:8112 Indian Standard Specification for high strength ordinary portland

cement

IS:8142 Indian Standard Specification for determining setting time of concrete

by penetration resistance

IS:8989 Safety code for erection of concrete framed structures

IS:9013 Indian Standard Specification for method of making, curing and

determining compressive strength of accelerated‑cured concrete test

specimens

IS:9077 Code of practice for corrosion protection of steel rails in RB and RCC

construction

IS:9103 Indian Standard Specification for admixtures for concrete

IS:9417 Indian Standard Specification for welding cold worked steel bars for

reinforced concrete construction.

16.0 Reinforcement Steel:- Reinforcement Steel shall be procured by the contractor only. Reinforcing steel shall be clean and free from loose mill scales, dust, loose rust and coats of paints, oil, grease or other coatings which may impair or reduce bond.

**16.1** Mild steel reinforcement shall cover all hot rolled mild steel bars conforming to IS 432 (part-I) Grade-I.

**16.2** High yield strength deformed bars reinforcement either hot rolled deformed steel bars conforming to IS-1139 or cold twisted deformed steel bars conforming to IS 1786 shall be used unless otherwise specified. Grade of Reinforcement Steel shall be Fy 500 / Fy 550 grade

**16.3 Structural steel sections and plates shall conform IS: 226 and IS :** 2062 The quoted rate shall include the cost and conveyance of all materials, labour, tools, tackle, plant and equipment, cutting, bending, placing in position, binding wires etc. complete for finished item of work.

**17. Plastering**

**17.**A. Sand for plaster shall have the characteristics specified in IS:1542.

The sand shall not contain any harmful impurities, as specified in Clause 3.3 of IS:2117. The maximum quantities of clay, fine silt, fine dust and organic impurities in sand shall not exceed the following limits.

a . Clay, fine silt and fine dust : Not more than three (3) percent

(determined in accordance with by weight.

IS:383, Appendix‑C and also

IS:2386 Part II)

b. Organic impurities : Below that indicated by comparison

(determined in accordance with with standard solution specified in

IS:2386 Part II) Clause 6.2.2 of IS:2386 Part II.

B. Plaster shall be applied only when walls are perfectly dry. Jutting or recessed edges shall have sharp or suitably round corners, as specified by the engineer. Plaster of all kinds, either smooth or round finished, shall never show cracks, faulty alignment, either in horizontal or vertical planes, detachment from walls , blisters or other faults and shall have a uniform and perfectly smooth appearance. However, the new plaster shall not be trowelled to a glazed surface since white wash would not adhere to it.

C. Any faulty plastering shall in any event be removed and replaced at the contractor's expense at the sole discretion of the engineer.

D. The joints of brick work and masonry shall be raked out to 10 mm deep with mortar still green to form key for the cement plaster and surfaces to be plastered, if not sufficiently rough, shall be thoroughly picked and roughened to provide a good bond for the plaster. The rates for plastering shall be inclusive of preparing the surface as above.

E. Cement and sand shall be mixed dry and then just enough water added to form an easily workable paste. In no case shall mortar which has been allowed to stand more than twenty (20) minutes after mixing, be used.

F. The surface of brick work, stone, concrete and other structures to be plastered shall be thoroughly cleaned from dust. dirt, oil, salt and bituminous spots, wetted, as directed before the application of the rendering coat.

G. All scaffolding log holes shall be properly filled in advance of plastering as scaffolding is being taken down.

H. Patches of plaster nearly 150 mm x 150 mm should be put three (3) meters apart horizontally and vertically to correct plane and to the specified thickness. In case of floors and ceilings, the mortar slab shall be truly horizontal or to specified slope and shall be provided 3 meters apart in both directions.

I. The plaster shall then be laid in single coat correct to the line connecting the 150 mm x 150 mm patches laid before hand. This shall be beaten with thin strips of bamboo about one meter long to ensure thorough filling of the joints and then brought to a true surface by working a wooden straight edge reaching across the patch as with small upward and side ways movement at a time. The surface shall be finished smooth with wooden floats and shall be of first class workmanship of required texture to the satisfaction of the engineer. Excessive trowelling or overworking the float shall be avoided. During this process a solution of live putty shall be applied on the surface to make it workable. In case of internal walls, the plaster shall be left off in a straight line 225 mm above the floor level. This together with portion of the floor near the wall shall be plastered together, the junction being curved to a radius of 35 mm or larger if so specified on the drawings.

J. For any increase in plaster thickness due to irregularities in brick work face,

thecontractor will not be entitled for any extra payment.

K. Proper precautions shall be taken to see that each coat of plaster is cured for a maximum period of fourteen (14) days by an approved method. Curing shall be done as soon as the applied plaster has hardened enough so as not to be damaged. The dates on which plastering is done shall be legibly marked on the various sections plastered so that curing for the specified period can therefore be watched.

L. The contractor shall take every precaution, right from the commencement of plaster work to prevent any defects that may appear on the surface of the plasters, and shall be responsible to make good any portion of the work which in the opinion of the engineer required removal and/ or redoing.

M. The uneven face plastering 20 mm thick shall be applied in two layers. The first coat 17 mm thick with the second coat 4 mm thick applied after the under coat has sufficiently set but not dried and in any case within 48 hours. The plaster of under coat when brought to a true surface with a wooden straight edge, the surface shall be left rough and furrowed 2 mm deep with a scratching tool diagonally both ways to form key for the finishing coat.

N. Plastering of the ceiling shall be done before wall plastering. Wall plastering shall be done from the ceiling downwards.

O. In suspending work at the end of the day the plaster shall be left, cut clean to line both horizontally and vertically, when recommencing the plastering the edge of the old work shall be scrapped, cleaned and wetted before plaster is applied to adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of wall and not near than 15cm to any corners or recesses. Horizontal joints in plaster work shall not occur on parapet tops and coping, as these invariably lead to leakage. No portion of the surface shall be left-out initially to be patched up later on.

P.If directed by the engineer, the contractor shall use approved water proofing admixtures made by reputed manufacturer in the mortar for plastering work. The quantity to be used etc., shall be in accordance with the manufacturer's instructions subject however to the approval of the engineer. These admixtures shall not contain calcium chloride unless specially allowed by the engineer and shall conform to IS:2645. payment shall be made for actual quantity of such admixtures used unless it is already covered in the rates for the work concerned.

**Measurement :**

Plastering on walls and ceilings shall be measured by their actual finished surface, without taking into account jutting parts, etc., no special allowance or extra price shall be computed for these parts, nor for corners and angles. Prices are intended either for plane or curved surfaces. Provisions of transition grooved mouldings between walls and ceiling or between walls, with radius not larger than 150 mm is also included in the price, keeping in mind that plaster work shall be measured also in this case as having sharp corners.

All area openings, doors, windows, fan openings etc., shall be deducted while paying for plastering work. The plaster prices are intended to include also finishing at bottom after completion of floors.

Plastering shall be measured by their actual finished surface in square meters.

**17.1 For Walls (Uneven faces)**: The walls of uneven faces of superstructure are to be Smooth/ sponge plastered in one coat in 20mm thick in CM (1:5). The dubara Smooth/ sponge finish plastering is to be done on uneven faces of wall as per the schedule-A and APSS.

**17.2 For Walls (Even faces)** : The walls of even faces of superstructure are to be dubara smooth/ sponge plastered in one coat in 12mm thick in CM (1:5). Smooth finish plastering is to be done on even faces of wall as per the schedule-A and APSS.

**17.3 Under side roof slab/Ceiling**:- The underside roof slab (i.e. ceiling) is to be finish plastered 12mm thick in one coat in CM(1:3) at all heights. The sponge finish plastering is to be done as per schedule-A and APSS. .

**17.4 Over RCC Roof Slab**:- Provided **Impervious coat over exposed RCC Roof slab surfaces** to required slopes with Polymer Acrylic Water Proofing layer of approved make as per manufacturer's specifications and over the layer 25 mm average thickness of screed cement concrete in CC 1:2:4 using 6 mm coarse aggregate with mixing of integral water proofing chemical at 150 ml per 50 kg of cement and over the screed concrete 4mm thick neat coat of cement plaster in CM 1:4 with mixing of integral water proofing chemical of approved make at 150 ml per 50 kg of cement and thread lining of regular intervals of 45 x 45 cms including and cost and conveyance of all materials, water, all labour charges, chemicals, curing for specified number of days, rounding off junctions of wall and slab, all leads, lifts, heights, levels and floors etc. complete as directed by the engineer-in- charge for finished item of work.

**17.5 For Drains:-** The walls of drains, UG sump, O.H. tank, columns in cellar floor, parapet walls are to be plastered with CM(1:5) 12mm thick for drains at all heights. The plastering is to be done as per schedule-A and APSS**.**

**17.6 For Compound wall:-** The retaining wall are to be plastered with CM(1:5) 20mm thick for all heights. The plastering is to be done as per schedule-A and APSS**.**

**17.7 FOR SUNKEN PORTIONS:-** Providing and laying of **Impervious coat in Sunken protion of slabs** to required slopes with CM 1:3 of 20 mm thick per-mixed with water proofing chemical compound of approved quality & make and ISI Mark at 1 kg per one bag of cement (or as per the recommendations of the manufacturers) laid over sunken / roof slab when it is green, rendered smooth with a floating coat of neat cement including and cost and conveyance of all materials, water, all labour charges, chemicals, curing for specified number of days, rounding off junctions of wall and slab, all leads, lifts, heights, levels and floors etc. complete for finished item of work and as directed by the engineer-in-charge.

**17.8 The quoted rate for plastering works shall include**

* 1. Erecting, dismantling and removing of the scaffolding.
  2. Preparing the surface to receive the plaster.
  3. Providing cement plaster with specified finish and specified thickness.
  4. All labour, cost and conveyance of all materials, use of tools and equipment to complete the plastering as per specification.
  5. Curing for 14 days.
  6. Any grooves, bands etc, if shown on the drawings or as directed by the Engineer-in-charge.
  7. All lifts and leads.
  8. All wooden frames, steel frames or other fixtures which are required to be painted or polished subsequently shall be cleaned after the plastering work is complete for finished item of work.
     1. Area of opening less than 0.5 Sqm: No deductions shall be made for the opening and no additions shall be made for reveals, jambs, soffits, sills etc.
     2. Area of opening between 0.5 Sqm and 3 Sqm: No additions shall be made for reveals, jambs, soffits etc. and deductions shall be as follows:

When only one face is plastered, no deduction shall be made.

1. When both faces are plastered to the same finish, deduction shall be made for one face only.
2. When the two faces are plastered with different finishes, deductions shall be made for that face on which the width of reveal is less, but no deductions shall be made on the other side.
   * 1. Area of opening greater than 3 sqm : Deduction shall be made for the actual opening and reveals, jambs, soffits, sill etc. shall be separately measured and paid.

18. PAINTING IRON WORK :

Paint to be used for various items of work shall be of best quality and shall be obtained ready mixed in sealed containers from approved manufacturer. The Contractor shall obtain the Engineer's approval for the make and colour of the paint he proposes to use. If required, polish for woodwork shall be tested as per IS:5807 (Parts I & III).

All surfaces shall be thoroughly cleaned of all dirt, loose particles and rust and approved prior to application of paint. For Steel gates & Rolling shutter surfaces, a priming coat without colouring matter shall be first applied after which all holes, cracks, etc., shall be stopped with putty and all knots properly killed with quick lime. Workmanship shall conform to IS:1477 (Parts I &II and 2338 (Part I).

Specified number of coats shall be applied and at least 24 house shall elapse between the application of successive coats. No painting shall be carried out on exterior work in wet weather or on surfaces which are not entirely dry.

Painting rate shall include all necessary scaffolding, cradles and plant. Measurements will be on the basis of Sq.m. for doors and windows, only the projected area will be measured, if such painting is not already a part of the item, without deducting for the glazed portions though not painted. The Contractor's rate should take this into account.

19 GATES and ROLLING SHUTTERS:-

19.1 Supply and fixing of Iron gates as per approved drawing with approved thick two coat of enamel over coat of anti rust paint including cost and conveyance of all materials and labour charges for fabrication and fixing, painting, hold fasts, hinges, locking arrangements etc. complete as directed by Engineer-in-charge SNO:144 IN SSR as directed by Eng-in- charge.Mode of Payment : The payment for the windows and ventilators shall be made on the basis of area in sqm specified.

* + 1. Supply and fixing of Collapsible steel shutters with verticle, double channel of 20x10x2mm of 100mm center Bracers with flat iron 40x40x6mm with 38mm dia steel pully with all fixtures and furniture as per spl.spn.1105 including cost and conveyace of all materials and labour charges etc. complete and as directed by Engineer-in-charge S.NO.116 IN SSR as per directions of Eng-in-charge.

20 PAINTING :

20.1 OUTSIDE WALLS :

Painting to External Faces of walls(outside) in all floors as specified with two coats of ACE or equivalent quality paint of approved colour make and shade over one coat of white cement primer including cost and conveyance of all materials, labour charges at all leads, lifts, hights, levels and floors,all incidental charges etc. complete for finished item of work.

20.2 INSIDE WALLS :

Painting in all floors as specified with two coats of oil bond distemper of approved colour make and shade over one coat of white primer including cost and conveyance of all materials, labour charges at all leads, lifts, heights, levels and floors,all incidental charges etc. complete for finished item of work .

The rate quoted includes cost of all materials, conveyance, taxes, scaffolding, all leads, lifts, all heights, levels, floors, curing ,all incidental charges etc. complete and as directed by Eng-in-charge.

1. No painting work shall be started unless specimen colours and shade are submitted in advance to the Executive Engineer/ Civil/ Gr.Hyderbad for approval, such approval of paint specimen by the Engineer does not relieve the contractor of his full and entire liability as to the life and quality of paint.

2. The Engineer-in-charge while work is in progress, may take samples of the products employed in the different Operations in order to have them analysed and tested as deem fit at the contractor’s expense.

3. Any deviations and defects shall have to be rectified by the contractor at his own expense. Contractor shall protect the work and materials by suitable covering or other method acceptable to Engineer-in-charge.

4. The contractor shall remove all the paint and varnish spots from floors, walls, glass panels and other surfaces and restore them to original condition. No impression of brushes should be visible on the wall surface.

5. Painting of second coat over the first coat should be right angle to the first coat application direction

Supply & Application of One Coat of Altek Water Based Cement Primer & Two Coats of Altek Alltimate (100% Pure Acrylic Emulsion Paint) after making surface even and free from all dents including cost and conveyance of all materials, labour charges at all leads, lifts, heights, levels and floors,all incidental charges etc. complete for finished item of work .

Providing Two coats of Painting to New Wood Works ie. doors in wooden frames and flush shutters, in synthetic enamel paint of approved make, colour and shade over single coat primer coat of wood primer, including cost and conveyance of all materials, labour charges, cost of brushes, emery papers, applying putty wherever necessary to get new finish etc complete, for finished item of work and to the satisfaction of engineer-in-charge.

20.3 PREPARATION OF SURFACE : The surface is to be prepared as per the relevant clauses of APSS/ISS and as directed by Engineer-in-charge. Application of primer and number of coats to be applied shall be as specified and as directed by Engineer-in-charge and as per manufacturer’s specification. The surface on finishing shall be absolutely uniform and smooth.

20.4 The Quoted rate shall include the following.

* 1. Supplying the paints of approved shade and make..
  2. Preparing different surfaces to be painted as per standard specification.
  3. Providing and erecting scaffolding and removing the same wherever necessary. Safety measure are to be followed to avoid mishaps. at the work site
  4. Lifting the materials to all heights.
  5. Application of Paint as per standard specification.
  6. Curing and Protecting the painted surface.
  7. Labour Charges, slandered tools and tackles should be used on the work like brushes etc.
  8. Any other incidental charges etc complete for finished item of work.

21 PAINTING NEW STEEL WORK :

* 1. New Steel work is to be painted with approved synthetic enamel paint (Asian/ Berger or equivalent) in two coats over one coat of wood primer.
  2. The Steel surfaces to be painted must be thoroughly dry, clean and smooth and must be approved by the Engineer-in-charge before any paint is applied.
  3. Primary Coat : It shall be of approved brand and shall be brushed uniformly free from brush marks etc.
  4. Stopping : After priming all small holes, cracks, open joints and similar minor defects of every kind shall be stopped with approved brand ready made putty.

**f) Synthetic enamel paint :**

* + 1. PAINT : Synthetic enamel paint and primer of approved brand, manufacturer and shade shall be used.
    2. PREPARATION OF SURFACE : Preparation of Surface shall be as per standard specification of APSS. The primary and number of coats to be applied shall be as specified and shall be applied as per manufacturer’s specification.
    3. Ready mix paint only preferred. No admixtures are allowed to add to the paint.

SECTION-6

BILL OF QUANTITIES

**SECTION – 6**

# A. PREAMBLE

1. The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, General and Special Conditions of Contract, Technical Specifications and Drawings.
2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Engineer and valued at the rates and prices tendered in the priced Bill of Quantities, where applicable and otherwise at such rates and prices of the Engineer may fix within the terms of the Contract.

The rates and prices tendered in the priced Bills of quantities shall, except in so far as it is otherwise provided under the Contract, include all constructional plant, labour, supervision, materials, erection maintenance, insurance, profit, taxes and

1. duties, together with all general risk, liabilities land obligations set out or implied in the contract.
2. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no items are provided the cost shall be deemed to be distributed among the rates and prices entered for the related items of work.
3. General directions and descriptions of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the contract documentation shall be made before entering prices against each item in the price Bill of Quantities.
4. The method of measurement of completed work of payment shall be in accordance with relevant I.S.S Codes.

Rock is defined as all materials which, in the opinion of the Engineer require blasting, or the use of metal wedges and sledge hammers, or, the use of compressed air, drilling for its removal, and which cannot be extracted by ripping with a tractor at least with 150 brake H.P with a single rear mounted heavy duty ripper

#### SECTION 7

**FORMS OF SECURITIES**

##### FORMS OF SECURITIES

Acceptable forms of securities are annexed. Bidders should not complete the Performance forms at this time. Only the successful Bidder will be required to provide Performance Securities in accordance with one of the forms, or in a similar form acceptable to the Employer.

**Annex A:** Bid Security (Bank Guarantee)

**Annex B:** Performance Bank Guarantee

###### BID SECURITY (BANK GUARANTEE)

###### ANNEXURE – A

Whereas \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (name of Bidder)(here in after called “the Bidder”) has submitted his bid dated \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (date) for the Erection of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (name of Contract) hereinafter called “the Bid”) with Bid specification No \_\_\_\_\_\_\_\_\_\_\_\_\_

Know all people by these presents that We \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (name of bank) of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (name of country) having our registered office at \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (hereinafter called “the Bank” are bound unto \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (name of Employer) (hereinafter called “the employer”) in the sum of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for which payment well and truly to be made to the said Employer the Bank binds itself, his successors and assigns by these presents.

SEALED with the Commission Seal of the said Bank this \_\_\_\_\_\_\_\_\_\_\_\_ day of 2011.

The conditions of this obligation are:

1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified in the Form of Bid.

1. If the Bidder having been notified of the acceptance of his bid by the Employer during the period of Bid Validity.
   1. Fails or refuses to execute the Form of Agreement in accordance with the instructions to Bidders, if required or
   2. Fails or refuses to furnish the Performance Security, in accordance with the Instruction to Bidders; or
   3. Does not accept the correction of the Bid Price pursuant to Clause 26.

We undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of one or both of the two conditions specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date \_\_\_\_\_\_\_\_ 2 days after the deadline for submission of Bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this guarantee should reach the Bank not later than the above date.

Date \_\_\_\_\_\_\_\_\_\_\_ Signature of the Bank \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Witness \_\_\_\_\_\_\_\_\_ Seal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Signature, name and address)

1. The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees. This figure should be the same as shown in Clause 16.1 of the Instructions of Bidders.

45 days after the end of the validity period of the Bid. Date should be inserted by the Employer before the Bidding documents are issued.

**PERFORMANCE BANK GUARANTEE**

**ANNEXURE – B**

To: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Name of Employer)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Address of Employer)

Whereas \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Name and address of Contractor) (hereinafter called “the Contractor”) has undertaken, in pursuance of Contract No. \_\_\_ dated \_\_\_\_\_\_\_ to execute \_\_\_\_\_\_\_\_\_\_\_\_ (name of Contract and brief description of works) (hereinafter called “the Contractor”).

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract:

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of \_\_\_\_\_\_\_\_\_\_\_\_ (amount of guarantee) 1 \_\_\_\_\_\_\_\_\_\_\_\_\_ (in words), such sum being payable in the payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavel or argument, any sum or sums within the limits of \_\_\_\_\_\_\_\_\_\_ (amount) of guarantee) 1 as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contractor or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until 28 days from the date of expiry of the Defects Liability Period.

Signature and seal of the Guarantor \_\_\_\_\_\_\_\_\_\_\_

Name of the Bank \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Address \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract including additional security for unbalanced Bids, if any and denominated in Indian Rupees.