

Ahmadabad Municipal Corporation

E-TENDERNOTICENO.: 2026-27

TENDERNO.: -06

TENDER DOCUMENTS FOR

**Misc. Repair and Maintainance works of Different Water Distribution Station
of South West Zone and other zones in under Water Project Dept. A.M.C.**

Volume I: - Technical Bid

Part - I: General

Section: - A

Section: - B

Section: - C

- (1) Tender download from : Website <https://tender.nprocure.com>
- (2) Last date of online Tender Submission : **23-06-2026 Up to 18.00 hours**
- (3) Date of Submission of Tender Fees, EMD & Other documents in hard copy : **24-06-2026** by Speed Post or Registered Post AD / Courier/ Hand delivery **up to 16.00 hrs.**
- (4) Date of e-Tender (Technical Bid) Opening : **25-06-2026 at 11.00 hours**

Municipal Commissioner

Ahmedabad Municipal Corporation
Sardar Patel Bhavan
Ahmedabad – 380 001 Gujarat (INDIA)
Phone : (091) – 79 – 25391811
Fax : (091) – 79 – 25350926
Website : www.egovamc.com

JUNE - 2026

SECTION: A

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A-2: MEMORANDUM OF WORKS IN BRIEF

A-3: SCOPE OF WORKS

A-4: INSTRUCTIONS TO TENDERERS

**A-5: QUALIFICATION CRITERIA FOR
TENDERER**

SECTION-A: GENERAL

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A-1: NOTICE INVITING

TENDER SECTION: A-1

To,

Sub. :- Misc. Repair and Maintainance works of Different Water Distribution Station of South West Zone and other zones in under Water Project Dept. A.M.C.

Dear Sir,

The Municipal Commissioner of Ahmedabad Municipal Corporation (AMC) invites the online percentage rate tenders (two-bid system) from the prosperous, experienced bidders and who qualifies the eligibility criteria, as mentioned in Section – A.5 of the tender document for **Misc. Repair and Maintainance works of Different Water Distribution Station of South West Zone and other zones in under Water Project Dept. A.M.C.**

One sets of tender documents containing –

Volume –I : Technical Bid

**Part –I : (Section – ‘A’, ‘B’, ‘C’) – Tender
Notice, General Conditions of
Contractetc.**

**Part – II : (Section – ‘D’,) – Technical
Specifications**

Volume–II: Financial Bid

Schedule of Quantities and Rates (Section – ‘F’)

Along with conditions of contract will be available from the website<https://tender.nprocure.com>. Tenderers shall have to present D.D. of **Rs.2,400/-** as tender fee along with the tender or have to deposit **Rs.2,400/-** along with tender at the time of submitting the tender to AMC (Projects). Tenderers will have to obtain digital signature in order to submit the bid for this tender.

An unconditional bank guarantee/Demand Draft/Pay Order (Earnest Money) on required stamp paper from the Bank, acceptable to the Corporation for **Rs.79665/-** must accompany each tender. All the Tenderers have to submit this bank guarantee/D.D./Pay Order as specified in the tender document.

The successful Tenderers shall have to pay security deposit in Indian Rupees in approved Form ‘A’ enclosed with the tender document.

The Earnest Money of the unsuccessful Tenderers(s) (L2 and L3) will be returned by AMC, after the award of this contract has been finalized. Earnest Money of Remaining Contractors will be released within 7 days.

The tender shall be accompanied with the copy of **Income Tax return of year – 2024-2025 (or latest year's) with copy of PAN Card.**

Please note that only tender fees, EMD, Affidavits, Undertaking / MOU and Addenda shall be submitted in hard copy with bidder forwarding letter in sealed envelopes

Copies of Similar type of works carried, works on hands, details of technical Personnel, financial capacity, bidding capacity and required details in Schedules (Format) given in Section-B6 and all other required tender documents for tender evaluation duly filled as specified in tender must be uploaded Online.

Technical Bid in Hard copy shall be submitted only by Successful bidders upon intimation from AMC.”

The Technical envelop (comprising of EMD & Tender Fees, Affidavits, Undertaking and Addenda only) shall be submitted in sealed envelopes as described, so as to reach at the following address on or before the date and time mentioned in tender notice by Registered AD Post/ Speed Post/ Hand Delivery/ Courier.

**Assistant Manager (Projects),
PWA Office,
Ahmedabad Municipal Corporation,
Sardar Patel Bhavan, Danapith,
Ahmedabad – 380 001 (Gujarat) – INDIA**

Technical and financial bid with required data shall be submitted on-line on tender.nprocure.com.

The Tenderers shall clearly state in the **forwarding letter (in duplicate)** to be enclosed with the tender documents, the deviations from General Terms and Conditions, if any with cross references. **If no such letter is received, it will be presumed that the Tenderers agree entirely with the General Terms and Conditions.**

All details and schedules required for pre-qualification and technical evaluation shall be submitted in soft copy (online) in prescribed format.

Document fees, EMD in form of Bank Guarantee / DD/Pay Order as per AMC Approved Bank List Shall be submitted in a sealed envelope to AMC before prescribed date.

Financial bid shall be submitted online on <https://tender.nprocure.com>

The **technical bids** from the bidders received, will be opened online in the presence

of the bidder's representatives who chose to attend at the office of **Assistant Manager Project, Sardar Patel Bhavan, Danapith, Ahmedabad Municipal Corporation, Ahmedabad – 380 001 (Gujarat) – INDIA**, and the technical bids will be scrutinized by Ahmedabad Municipal Corporation for satisfying various eligibility criteria prescribed for the bidders for this work.

Then, the **financial bids** from the eligible Tenderers only will be opened online. **The actual date of opening of financial bids will be communicated to technically qualified bidders at a later date.**

Tenders received **without EMD** will be considered as **Non-Responsive** and **will be rejected outright.**

The conditional tender **will not be accepted and will be rejected outright**, unless, the nature of condition(s) put for by the bidder is acceptable to AMC. **Any suggestions/ alterations from the tender specifications, if suggested, must be mentioned in the main forwarding letter.**

The Tenderers shall quote (+/-) **percentage online in schedule of quantities and rates both in figures and words in volume-II**, Item rate shall be quoted online of the tender document (Financial Bid).

The Tenderers shall have to attach the following documents in **duplicate** with the tender:

- i) **A true copy of registration as an approved Contractor in 'D' class, registered with AMC, State and Central Government and other Corporations /Boards.**

Incomplete tender who does not fulfill any of the above conditions will be liable for rejection. Tender will also be liable to be rejected if–

- i) The Tenderers proposes any alteration in the work specified or in the time allowed in carrying out the works or make corrections in Schedule of Quantities.
- ii) Any of the page or pages in the tender is / are removed or replaced.
- iii) All corrections, additions or pasted slips are not initialed by the Tenderers.**
- iv) Any erasure is made in the tender.
- v) The Tenderers or in the case of a firm, each partner or the person holding **the power of attorney thereof does not sign or the signature(s) is (are) not attested by the witness, wherever it is required.**
- vi) The Tenderers returns the tender document without signing relevant pages of the bid.**

Acceptance of the tenders will rest with the competent authority who does not bind himself to accept the lowest tender and reserves the right to reject any or all tenders without assigning any reason thereof.

It must be clearly and distinctly understood that the conditions of contract and specifications shall be rigidly enforced and no relaxation on the grounds of customs prevailing shall be allowed.

The rates should be quoted exclusive of GST but inclusive of all other taxes.

The Tenderers shall be considered to have visited the site of work, fully acquainted himself with the local situations regarding materials, labour and other factors pertaining to work and studied the plans and estimates before submitting the tender.

In the event of a discrepancy between description in words and figures quoted by the Tenderers, the description in words shall prevail.

The tender for the work shall remain open for a period of **120 days** from the date of opening of the price bid and the Tenderers shall not be allowed to withdraw or modify the offer on his own during this period any modifications or additions in terms and conditions of his tender not acceptable to the Addl. City Engineer (Water Project), The Addl. City Engineer (Water Project) **shall without prejudice to any right or remedy, be at liberty to forfeit in full the said earnest money absolutely.**

The Corporation reserves the right to reject all the tenders of the lowest or any other tender which in the judgment of the corporation does not appear to be in its best interest and the Tenderers shall have no cause of action or claim against the Corporation of its officers, employees, successors for assignees for rejection of its tender. The Municipal Commissioner does not bind himself to accept the lowest or any tender. **Tender documents are not transferable.**

- (a) The Contractor shall furnish to the Addl. City Engineer (Water Project) ,every week during the progress of the works, classified weekly returns of the number of the people employed on the work during the week. The report of skilled and unskilled labour shall be given in the prescribed forms or in separate statement.
- (b) Details of machineries deployed on site also shall be furnished by the Contractor, every week.

The Tenderers, if directed by the Engineer in charge; shall increase or decrease the strength of the labour both skilled and unskilled. The Contractor shall also furnish the following returns:

- (a) A report of any accident which may have occurred within 24 hours of its occurrence.

The Tenderers shall strictly observe all the requirements laid down in the Contract Labour (Regulation and abolition) Act, 1970 and the Contract Labour (Regulation and Abolition) (Gujarat) Rules, 1972 and other acts as amended from time to time so far as applicable. The Tenderers should obtain necessary permission, license and registration from the labour commissioner, as per labour law.

The work is to be completed in all respects within **12 (Twelve)** months including monsoon, reckoned from the date of written order to commence the work.

The Tenderers shall carefully read the eligibility criteria, furnish the details and satisfy the same; otherwise **the tender will be rejected without assigning any reason.**

The Tenderers is required to check the web site for Addendum if any, before 48 hours of tender submission date and time. The Tenderers who quotes the tender without attaching the addendum will be rejected.

This notice will form part of the Contract.

Note: 'Form B1' referred in this contract shall be read as Section – B1.

Signature of Contractor

Additional City Engineer (Water Project)

Name :

Ahmedabad Municipal Corporation

Company's seal :

Date :

Date :

A-2 : MEMORANDUM OF WORKS IN BRIEF

SECTION : A-2

- A.2.1 **Name of Work** : **Misc. Repair and Maintainance works of Different Water Distribution Station of South West Zone and other zones in under Water Project Dept. A.M.C..**
- A.2.2 **Estimated Cost** : **Rs. 79,66,444.00**
- A.2.3 **Earnest Money** : **Rs. 79665/-**
- A.2.4 **Validity Period of Tender offered** : **120 days from the date of opening of the price bid.**
- A.2.5 i) **Security Deposit** : **5% of the Contract value in the form of Bank Guarantee/ Demand Draft.**

The security deposit shall be payable in 15 days from date of receipt of LOI failing which interest @ 4 % per annum will be charged by AMC

(Bank Guarantee issued from Ahmedabad Branch only as per para A.4.24. If bidder submit bank guarantee outside Ahmedabad branch then in bank guarantee clearly mention this bank guarantee is payable in following Ahmedabad bank branch.).
- ii) **Retention Money** : **2% of the bill amount to be deducted from running bills & will be return at the time of final bill.**
- A.2.6 **Time allowed for completion of the work from the date of written order to commence** : a) **12 (Twelve)months including of monsoon period**
b) **If the site is not cleared to start the work, the time limit will be considered from the date of possession given to start the work.**
- A.2.7 a) **Tender Document shall be available** : AMC's website <https://tender.nprocure.com>
- b) **Date on which the tender must reach the office** : **24-06-2026 up to 16:00 hrs.(As mentioned in the Notice inviting tender)**

c) Mode of submitting the filled up tender (online) : 23-06-2026 up to 18:00 hrs.

d) Description essential to be made on sealed cover :

- a) **Misc. Repair and Maintainance works of Different Water Distribution Station of South West Zone and other zones in under Water Project Dept. A.M.C..**
- b) **Contact No.:**
- c) **Last date of Receiving tender By corporation : 24-06-2026**

	e) Mode of quoting rate in Schedule of quantities (in Volume – II)	:	In figures as well as in words to be done on line in Vol. II only. The tenderer should not mention his percentage (+/-)in volume – I or in his forwarding letter as that will lead to rejection of tenders.
A.2.8	Tender opening	:	At the time of opening of tender only Volume - I (Technical bid) of all the tenders will be opened online. After scrutiny of this Volume-I, the Volume-II (Financial Bid) of those tenderers, satisfying the eligibility criteria will be opened.
A.2.9	Execution of work	:	Work shall start and progress simultaneously as per the priority and as directed by Engineers-in-charge.
A.2.10	Performance Guarantee	:	5 % of the Contract value of a work as a Performance Guarantee and will be released after 6 months from the date of completion of the work or One Monsoon, Whichever is later.
A.2.11	EMD	:	<p>B.G/D.D. No. _____ Dt. _____,</p> <p>Drawn on _____ Bank _____</p> <p>Payable at Ahmedabad is enclosed herewith representing the earnest money, the full value of which is to be absolutely forfeited by AMC, should I / We not deposit the full amount of security deposit specified above.</p>
A.2.12	Price-Bid	:	The rates should be quoted exclusive of GST but inclusive of all other taxes as per Volume-I, B-2 GENERAL CONDITIONS OF CONTRACT, Clause-48.

Note:

Please note that only tender fees, EMD, Affidavits, Registration Certificate, Undertaking / MOU and Addenda shall be submitted in hard copy with bidder forwarding letter in sealed envelopes.

Copies of Similar type of works carried, works on hands, details of technical Personnel, financial capacity, bidding capacity and required details in Schedules (Format) given in Section-B6 and all other required tender documents for tender evaluation duly filled as specified in tender must be uploaded Online.

Technical Bid in Hard copy shall be submitted only by Successful bidders upon intimation from AMC.”

The Technical envelop (comprising of EMD & Tender Fees, Affidavits, Registration Certificate, Undertaking and Addenda only) shall be submitted in sealed envelopes as described, so as to reach on or before the date and time mentioned in tender notice by Registered AD Post/ Speed Post/ Hand Delivery/ Courier.

- **Rates exclusive of GST but inclusive of all other taxes**

-

The rates to be quoted by the Contractor must be exclusive of GST but inclusive of all other taxes. However any subsequent changes in the tax structure by Government after due date of bid submission will be compensated on availability of submission of actual documentation. Contractor has to intimate Engineer in charge regarding changes occurred in the tax structure after bid submission. If contractor fails to provide such information and if may financial obligation may arise due to change in tax structure, same will be recovered from the contractor.

The contractor shall apply fair means of stock maintenance and shall adopt accounting standards as may be prescribed under GST. For arriving at the difference in procurement prices due to introduction of GST, it will be open for the Government to ask for original invoices, LR, weigh bridge slips; payment details and such other documents as may be required for the purpose. If there is reduction in overall tax burden then proportional benefit of that shall be passed on to the Government.

Signature of Contractor

Additional City Engineer (Water Project)

Name :

Ahmedabad Municipal Corporation

Company's seal :

Date :

Date :

A-3: SCOPE OF WORKS SECTION : A-3

The broad scope of civil work for Misc. Repair and Maintainance works of Different Water Distribution Station of South West Zone and other zones in under Water Project Dept. A.M.C. The work shall be carried out in accordance with specifications and instructions of Engineer in charge issued from time to time.

Scope of Work:

Civil Works

The works include Excavation work, Carting Re-carting work, Filling Work, Demolition work, Bricks/RCC works, plastering works, Painting work repairing existing doors & windows, fixing new aluminum & steel doors, Rolling shutter, I.P.S. Paving, Stone paving, Glaze Tiles, Storm Water & Drainage pipeline work & Plumbing Work, exterior apex paint, interior White Wash, RCC Road, Paver block, Epoxy paint on fabrication work, Plumbing work & Other civil works as per specification specified in technical Specification.

Signature of Contractor

Additional City Engineer (Water Project)

Name:

Ahmedabad Municipal Corporation

Company's seal:

Date:

Date:

A-4 : INSTRUCTIONS TO TENDERERS

SECTION : A-4

Note

These instructions are provided to assist tenderers while preparing their tenders. They do not form part of the Contract and they shall not be taken into consideration in interpreting or construing the Contract.

Invitation to Tender

The Municipal Commissioner for and on behalf of the Ahmedabad Municipal Corporation, Ahmedabad, hereinafter referred to as the Corporation, will receive on line tenders for the construction works according to the specifications and Schedule of Quantities in the tender documents herewith attached.

Tenders will not be accepted after the hour and date fixed for receiving of tenders. Telegraphic tenders will not be accepted under any circumstance. Tenders received after the hour and date so fixed will not be considered. Tenders will be received up to **16.00 hours on or before 24-06-2026**. Tenderer's authorized re-preventatives may attend the tender opening. The date and time for opening of tenders will be communicated to tender are separately.

However, the Corporation reserves the right to reject all the tenders or the lowest or any other tender which in the judgment of the Corporation does not appear to be in its best interest, and the tenderer shall have no cause of action or claim against the Corporation or its officers, employees, successors or assignee for rejection of its tender.

The Municipal Commissioner does not bind himself to accept the lowest or any tender. If the tenderer wishes to offer discount in the event of the entire work being awarded to him, he shall state so in the tender.

Tender documents are not **transferable**.

Tender Validity Period

The tender shall be kept valid for acceptance for a period of one hundred twenty (120) calendar days from the date of opening of financial bids.

Language of Tender

Tenders shall be submitted in English, and all information in the tender shall be in English. Information in any other language shall be accompanied by its translation in English. Failure to comply with this may disqualify a tender. Only English text shall be governing.

Documents

One sets of tender documents (Vol. I & Vol. II, drawings & addendum if any), comprehensively referred to as Tender Document, are issued to every tenderer. The details of the Tender Document referred above are as follows:

Volume –I : Technical Bid

**Part –I: (Section – ‘A’, ‘B’, ‘C’) – Tender Notice,
General Conditions of Contract etc.**

Part – II: (Section – ‘D’,) – Technical Specifications

Volume–II: Financial Bid

Schedule of Quantities and Rates (Section – ‘F’)

Earnest Money

Each tender must be accompanied by a receipt for Earnest Money Deposit as Demand Draft/Bank Guarantee/Pay Order in the prescribed form, from a bank acceptable to the Corporation. Tender deposit is accepted as detailed out in Section-B.

Tenders not accompanied by Earnest Money as required shall be rejected as non-responsive.

In case of Bank Guarantee/Demand Draft, the same shall be valid for **120 days** from the price bid opening date.

If during the tender validity period, the tenderer withdraws his tender or the successful tenderer fails to accept the contract within 10 calendar days after receiving notice of the award of contract and fails to submit contract deposit, **the earnest money in the form of D.D/ bank guarantee/Pay Order shall be forfeited and the tenderer may be disqualified from tendering for further works with the Municipal Corporation of Ahmedabad.**

A list of banks from whom guarantees will be acceptable by the Corporation is attached to these Instructions. Tenderers are requested to verify from the Corporation the wording of the Tender Guarantee if they consider any modification is necessary and also to enquire about acceptability of the bank by whom the guarantee will be given, as possible during the tender period.

After the award has been finalized, the Earnest Money will be returned to the respective tenderers, with the exception of the successful tenderer.

The successful tenderer's earnest money will be retained as security after signing the contract and for making of the contract deposit. In case of Bank Guarantee/Demand Draft, successful tenderer's Bank Guarantee/Demand Draft will be returned after furnishing the contract deposit.

No interest will be paid on any tender deposit /guarantee.

Income Tax Clearance Certificate

In case of domestic tenderers, the tender must be accompanied by an Income-Tax Clearance Certificate for the last three financial years in the form attached (Form 'B'). In case it is not possible to furnish such a certificate, the tenderers should submit with the tender, information regarding the Income-Tax, circle or ward of the district in which he is assessed for Income Tax, reference number of the assessment and the assessment year in the form attached (Form 'C'). **If a tender is submitted without complying with these requirements, it is liable to be rejected outright.**

Submission of Tenders

Tenders shall be submitted online in three (3) stages as prescribed on website amc.nprocure.com. In the event of a Contract, the tender and the documents attached thereto shall be considered as forming part of the Contract Documents.

EMD & Tender Fees, Affidavits, Registration Certificate Undertaking and Addenda only submitted to AMC in sealed envelope, so as to reach by up to **16.00 hrs. on 30/11/2023** at the following address

**Assistant Manager (Projects),
P.W.A. Office,
Ahmedabad Municipal Corporation
Sardar Patel Bhavan
Ahmedabad – 380 001.**

The sealed envelopes shall show on the outside, the name of the tenderer and his address. In addition, the lower left hand corner of the envelope or other container should indicate **the Contract number** and the **tender opening date**. Tenders which are opened before the due date with no indication having been given on the outside of the envelope or container to indicate that it is a **tender liable to be disqualified**.

No tender shall be accepted unless both the envelope is sealed. Tenderers shall not be allowed to fill in or seal their tenders at the Municipal Office. **Tenderers are requested to present the tenders in good time on the stipulated day so as to avoid rush at the closing hours.**

Envelope of the tender document shall be accompanied by the following documents in **duplicate**:

- (a) Vol. I of the tender with duly signed.**

- (b) **A receipt for a deposit as earnest money as detailed in item A.4.6, above.**
- (c) **In case of domestic contractor, an income-tax clearance certificate as detailed in item A.4.7,above**
- (d) **A certificate of registration as approved Contractor should be attached with the tender.**

Deleted

Time being the essence of the contract; the tenderers should indicate the tender completion date(S). The desired completion requirements of the Corporation are indicated in the specifications attached.

Erasures and other changes shall be noted over by the initials of the person signing the tender.

General Performance Data

Tenderers shall present the following information online / hard copy:

- (a) **Evidence of financial capacity to execute a contract of this magnitude in terms of solvency certificate, annual turnover.**
- (b) **The bidders are requested to furnish requisite information as described in Section: A-5 so as to enable the competent authority to decide the technical and financial capability of the bidder, based on which, the bidder shall be evaluated.**
- (c) **Experience of similar works with names of authorities for which the works were executed.**

Tenders will not be considered if the above information is not provided or is considered to be unsatisfactory.

Signing of Tender Document

Tenderers are requested to sign the Bank Guarantee Form – A, placed in Section : A-4 of Volume I. Schedule of Quantities in Volume–II etc. after making appropriate enquiries wherever necessary.

If the tender is made by an individual, it shall be signed with his full name above his current address.

If the tender is submitted by a proprietary firm, it shall be signed by the proprietor above his name and the name of his firm with its current address.

If the tender is made by a firm in partnership, it shall be signed by all the partners of the firm above their full names and current addresses, or **by a partner holding the power of attorney for the firm signing the tender in which case a certified copy of the power of attorney shall accompany the tender. A certified copy of the partnership deed, current address of the firm and the full name and the current address of all the partners of the firm shall also accompany the tender.**

If the tender is made by a limited company or a limited Corporation, it shall be signed by a duly authorized person holding the power of attorney for signing the tender, in which case, a certified copy of the power of attorney shall accompany the tender. Such limited Company or Corporation may be required to furnish

satisfactory evidence of its existence before the contract is awarded.

All witnesses and sureties shall be persons of status and probity and their full names, occupations and addresses shall be stated below their signatures.

The tenders from Contractors shall be accompanied by an attested copy of income-tax clearance certificate from the Income-tax Officer of the Circle for the previous financial year.

All signatures in the tender documents shall be dated.

Interpretation of Documents

Tenderers shall carefully examine the Tender Documents and fully inform themselves as to all the conditions and matters which may in any way affect the work or the cost thereof. Should a tenderer find discrepancies in or omission from the specification or other documents, or should be in doubt as to their meaning, he should at once address a query to the Addl. City Engineer (Water Project) as provided for in Clause A.4.8.8. Any resulting interpretation of the Tender Documents will be issued to all tenderers as an Addendum. Verbal clarification and/or information given by the Addl. City Engineer (Water Project) shall not be binding on the Corporation.

Errors and Discrepancies in Tenders

Should the Schedule of quantities and Rates (Vol. II) submitted with the tender be found to contain errors, or discrepancies the owner / engineer will not permit any bidder to change the substance or price of his bid after the bid opening. In case of discrepancy in the quoted percentage and the corresponding amount the percentage quoted in words in all cases shall govern. Also the bidder will not be permitted to correct or withdraw material deviations or reservations once bids have been opened.

Modification of Documents

Any Modification in the tenders, if required, will be made by an Addendum and on <https://tender.nprocure.com> AMC's website. **These shall be signed and returned by the tenderers and shall form a part of the tender document.**

The tenderer shall not add to or amend the text of any of the documents except in so far as may be necessary to comply with the Addendum.

Evaluation of Tenders

For evaluation and comparison of bids, **the following factors shall be considered in addition to the points mentioned in Clause A.4.22.1 of Section: A-4 of Volume-I.**

- i) **Technical competence.**
- ii) **Relative quality of previous jobs.**
- iii) **Organization setup.**
- iv) **Financial Capability.**

Policy for tenders under consideration

Tenders shall be deemed to be under consideration from the opening of tenders, until such time as an official announcement of award is made.

While tenders are under consideration, tenderers and their representatives, or other interested parties, are advised to **refrain from contacting by any means any Corporation personnel or representatives on matters relative to the tenders under study**. The Engineer's Representative, if necessary, will obtain clarification of tenders by requesting such information from any or all the tenderers either in writing or through personal contact, as may be necessary. **The tenderer will not be permitted to change the substance of his tender after tenders have been opened.**

Alternatives

Deleted

Cost of Tendering

The Corporation will not defray the expenses incurred by tenderers in tendering and will not be bound to accept the lowest or any tender.

Award of Contract

Notification of award will be made in writing to the successful tenderer.

The contract will be awarded to the technically and financially qualified and responsive tenderer offering the lowest overall evaluated tender or tenders in conformance with specifications subject to the provisions in Clause No. A.4.14 and A.4.15 i.e. Evaluation of tenders and policy for tenders under considerations, mentioned earlier.

A responsive tender is one which accepts all the terms and conditions of the Tender Documents without any major modifications. A major modification is one which affects in any way the price, quality, quantity or completion of works or which limits in any way, any responsibilities or liabilities of the tenderer or any rights of the Corporation, as specified in the Tender Documents. The Corporation may waive any minor informality in a tender which does not constitute a major modification. **However, the failure of successful bidder to pay 'Security Deposit' and signing the contract shall constitute sufficient grounds for annulment of the award of contract and forfeiture of the earnest money deposit, in which case the Owner/Engineer may award the contract to the next lowest evaluated responsive bidder. In the event of not finding any such bidders, the employer is empowered to call for new bids.**

In case, the tender is found technically responsive, tenderer will be intimated accordingly. Financial bid of only technically qualified tenderer will be opened. Financial bid of the technically not qualified tenderer will be **returned un-opened**.

Signing of Contract

The successful tenderer shall be required to execute the Contract within **15 days** of receipt of intimation to execute the Contract, failing which the Corporation will be entitled to claim discount offered for payments of bills in spite of non-payment of the bills within the stipulated time, if such non-payment is the result of non-

execution of the contract by the tenderer. Moreover if the contractor will not pay security deposit and do the agreement within 15 days after issuing the first letter from the authority or corporation, for that the registration will be kept in abeyance for three years.

The person to sign the contract documents shall be the persons as detailed in Clause No. A.4.10 i.e. signing of tender documents.

Stamp Duty and Legal Charges

It shall be incumbent on the successful tenderer to pay stamp duty on the contract and legal charges for preparation of the contract agreement.

Solvency Certificate

Solvency Certificate of an amount 20 % of the tender estimated cost shall be enclosed with technical bid. Bank Solvency shall not be older than one-year period as on the last day of the month previous to the one in which Tender are invited. **If he fails to produce such certificate his tender will not be considered.**

Documents / Information to be submitted along with Volume – I (Technical Bid)

The following documents/information must be submitted by the tenderer in duplicate along with Volume-I of the tender.

- i. A certificate of registration as approved Contractor.**
- ii. A receipt for a deposit as earnest money or bank guarantee.**
- iii. An Income-tax clearance certificate for the last three financial years.**
- iv. A solvency certificate.**
- v. Details of the work of similar type and magnitude carried out by the tenderer including names of the authorities for which works were executed.**

Bidders not submitting the above mentioned information along with their tenders as per clause above, the tender will not be considered for evaluation and the bid will be outright rejected.

Bidder to note that the time being essence of contract, mechanical means of excavation will have to be used to the maximum extent and quote accordingly.

Contractor to read this clause carefully:

Department of Labour and Employment, Government of Gujarat, Sachivalaya, Gandhinagar, Vernacular Resolution No.RGR-102003-966- 2 (2) dated 04-07-2003.

As required under the above resolution bidders are requested to give assurance about how many Skilled, Unskilled and other categories of personnel / workers they will employ on this work. If the bidders fail to give assurance about this, his tender will not be considered. Contractor will have to submit quarterly report to AMC, which will be submitted to Department of Labour and Employment regarding the employment given to different categories of personnel under this work based on the details submitted by the tenderers. (As

per Schedule B.6.9attached)

All Circular relating to the works published on the AMC web sites will be applicable.

Signature of Contractor

Additional City Engineer (Water Project)

Name :

Ahmedabad Municipal Corporation

Company's seal :

Date :

Date :

FORMATE FOR BANK GUARANTEE FOR EARNEST MONEY

- [1] In consideration of the Terms and Conditions of the tender invited by Commissioner, Ahmedabad (hereinafter called "Ahmedabad Municipal Corporation") and(Contractor) (hereinafter Called "Contractor" for the work of (Name of Work) for thedeposit for the due fulfillment by the Contractor of the terms and condition contained in said tender, We bank of(Hereinafter referred to as the bank) at the request of (Name of Contractor) do hereby undertake to Pay the Ahmedabad Municipal corporation an Amount not exceeding Rs..... (Total Earnest Money Deposit Amount) against any loss or damage casual to or suffered by Ahmedabad Municipal Corporation by reason of any breach of any terms or condition contained in the said tender by the said Contractor.
- [2] We bank of Do hereby undertake to pay the amount due and payable under this Guarantee without any demur merely on a demand from the Ahmedabad Municipal Corporation stating that the amount claimed in due by way of loss of damage caused to or would be caused to or suffered by the Ahmedabad Municipal Corporation by the reason of breach by the said contractor's failure to perform. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee shall be restricted to an amount not exceeding Rs..... (Total of Amount of Earnest Money Deposit).
- [3] We undertake to pay the Ahmedabad Municipal Corporation any money to demanded notwithstanding dispute or dispute raised by the contractor. In any suit of proceeding Pending before any court or Tribunal relating thereto, our liability under this presents being absolute and unequivocal. The payment so made by under and the contractor shall have no claim against us for making such payment.
- [4] We bank of, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the final award of contract of the said work and that under or by virtue of said tendered work have been fully finalized and its claim satisfied or discharged or till Commissioner, Ahmedabad Municipal Corporation, Ahmedabad clarified that the terms and conditions of the said tender have been fully and properly finalized by the said contractor and accordingly discharge this guarantee. Unless a demand or claim under this tender is made on to us in writing on or before (dt.) we shall be discharged from all liability under this Guarantee thereafter.

- [5] We bank of further agree with the Ahmedabad Municipal Corporation that the Ahmedabad Municipal Corporation Shall have the fullest liberty without our consent and without in any manner our obligations hereunder to vary any of the terms and condition of the said tender or to extend the time of performance by the said contractor from time to time or to postpone for any time or time to time any of the power exercisable by the Ahmedabad Municipal Corporation against the said contractor and to force or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any variation or extension being granted to the said contractor or for any forbearance, act or omission on the part of the Ahmedabad Municipal Corporation or any indulgence by the Ahmedabad Municipal Corporation to the said contractor or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision would relieve us.
- [6] This guarantee will not be discharged due to the change in the constitution of the bank or the contractor.
- [7] We bank of lastly under take not to revoke during its currency except with the previous consent of the Ahmedabad

NOT WITH STANDING ANYTHING CONTAINED HERE IN ABOVE:

- [1] Our liability under this bank guarantee is restricted to Rs. (Amount ofDeposit)
- [2] This Bank guarantee is valid up to
- [3] Our liability to make payment shall arise and we are liable to pay the guarantee amount or any part there in under this guarantee, only if served upon us a written Claim or demand in terms of the guarantee on or before dt.....

**THIS BANK GUARANTEE IS ENCASHABLE AT OUR BRANCH OFFICE
AHMEDABAD**

- [4] In written of bank has executed this present the day and year first written.

DatedDay of2023.

For (Bank Name)

**Seal, stamp and signature of
Bank's authorized Signatory**

FORMATE FOR BANK GUARANTEE FOR SECURITY DEPOSIT

- [1] In consideration of the terms and condition of the tender invited by Commissioner, Ahmedabad Municipal Corporation, Ahmedabad (hereinafter called “Ahmedabad Municipal Corporation”) and(Contractor) (hereinafter Called “Contractor” for the work of.....
.....(Name of Work) for thedeposit for the due fulfillment by the Contractor of the terms and condition contained in said tender, We bank of (Hereinafter referred to as the bank) at the request of (Name of Contractor) do hereby undertake to Pay the Ahmedabad Municipal corporation an Amount not exceeding Rs..... (Total Earnest Money Deposit Amount) against any loss or damage casual to or suffered by Ahmedabad Municipal Corporation by reason of any breach of any terms or condition contained in the said tender by the said Contractor.
- [2] We bank of Do hereby undertake to pay the amount due and payable under this Guarantee without any demur merely on a demand from the Ahmedabad Municipal Corporation stating that the amount claimed in due by way of loss of damage caused to or would be caused to or suffered by the Ahmedabad Municipal Corporation by the reason of breach by the said contractor’s failure to perform. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee shall be restricted to an amount not exceeding Rs..... (Total of Amount of Earnest Money Deposit).
- [3] We undertake to pay the Ahmedabad Municipal Corporation any money to demanded notwithstanding dispute or dispute raised by the contractor. In any suit of proceeding Pending before any court or Tribunal relating thereto, our liability under this presents being absolute and unequivocal. The payment so made by under and the contractor shall have no claim against us for making such payment.
- [4] We bank of, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the final award of contract of the said work and that under or by virtue of said tendered work have been fully finalized and its claim satisfied or discharged or till Commissioner, Ahmedabad Municipal Corporation, Ahmedabad clarified that the terms and conditions of the said tender have been fully and properly finalized by the said contractor and accordingly discharge this guarantee. Unless a demand or claim under this tender is made on to us in writing on or before (dt.) we shall be discharged from all liability under this Guarantee thereafter.
- [5] We bank of further agree with the Ahmedabad Municipal Corporation that the Ahmedabad Municipal Corporation Shall have the fullest liberty without our consent and without in any manner our obligations hereunder to vary any of the terms and condition of the said tender or to extend the time of performance by the said contractor

from time to time or to postpone for anytime or time to time any of the power exercisable by the Ahmedabad Municipal Corporation against the said contractor and to force or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any variation or extension being granted to the said contractor or for any forbearance, act or omission on the part of the Ahmedabad Municipal Corporation or any indulgence by the Ahmedabad Municipal Corporation to the said contractor or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision would relieve us.

- [6] This guarantee will not be discharged due to the change in the constitution of the bank or the contractor.
- [7] We bank of lastly under take not to revoke during its currency except with the previous consent of the Ahmedabad Municipal Corporation in Writing.

NOT WITH STANDING ANYTHING CONTAINED HERE IN ABOVE:

- [1] Our liability under this bank guarantee is restricted to Rs. (Amount ofDeposit)
- [2] This Bank guarantee is valid up to
- [3] Our liability to make payment shall arise and we are liable to pay the guarantee amount or any part there in under this guarantee, only if served upon us a written Claim or demand in terms of the guarantee on or before dt.....

THIS BANK GUARANTEE IS ENCASHABLE AT OUR BRANCH OFFICE
AHMEDABAD

- [4] In written of bank has executed this present the day and year first written.
Date the..... Month..... Year..... for (Bank Name).

**Seal, stamp and signature of
Bank's authorized Signatory**

FORM 'B'

INCOME-TAX CLEARANCE CERTIFICATE

1. Names and style (of the Company, Firm, HUF or Individual) in which the applicant is assessed or assessable to Income-tax and the addresses for the purpose of assessment:
2. Names and addresses of all Companies, Firms or Associations or persons in which the applicant is substantially interested in his individual or fiduciary capacity.
3. The Income-tax Circle/Ward/District in which the applicant is assessed to income-tax.
4. The following particulars are to be furnished concerning the Income Tax Assessments for the preceding four years:
 - (a) The total contract amount received during the preceding four accounting years (give date of the closing day of the year being previous year).
 - (b) Year Total Income Tax demanded, Tax paid, Balance due Tax assessed.coy of last income tax filed by the bidder.

Note :

- (i) Tax in Columns 3 and 4 should include all items viz. Income-tax, Sales Tax, Surcharges, Excess Profit Tax and Port Tax, etc.
- (ii) If any tax remains unpaid, the reasons should be explained in an attached statement.
- (c) In case there has been no income-tax assessment in any year, whether returns have been submitted under Section 22 (1) or 22(2) or tax has been paid in advance under Sections 18(A) (3) of the Act and if so, the amount of income returned for each year and tax for each of the four years mentioned above and the name of Income-tax Circle/Ward/District concerned where such returns have been paid. Give reasons why the income-tax is not assessed.

- (d) Whether any attachment or certificate proceedings pending in respect of the arrears.
- (e) The name and address of Branch(es), if any.

I declare that the above information is correct and complete to the best of my information and belief.

Signature of the Contractor

Registered No.

Signature

Address

Date :

In my opinion, the assesses mentioned above has been doing everything possible to pay the tax demanded promptly and regularly and to facilitate the completion of the pending proceedings.

This will remain valid for one year from the date of issue.

Signature of the Income-tax officer

Circle

Ward

FORM 'C'

INCOME TAX CLEARANCE CERTIFICATE

1. Name of style (of the Company,
Firm, HUF or Individual) in which
The tenderer is assessed or
Assessable to Income-tax and the
Addresses for the purpose of assessment _____

2. Name of address of all Companies,
Firms or Associations of persons
In which the applicant is substantially
interested in his individual
Fiduciary capacity. _____

3. The Income-Tax Circle/Ward/District
In which the tenderer is assessed to
Income-tax.

4. Reference number of the assessment
and assessment year _____

Signature

Address:

Signature of the Firm

- | | |
|-------------------------------|----|
| Names and private residential | 1. |
| | 2. |
| Addresses of the partners | 3. |
| Constituting the firm: | 4. |
| | 5. |

(Tenderer to strike out whichever is not applicable)

PERFORMANCE BOND

Annexure-I

(See Clause No.1(b))

(The date of this bond must not be prior to the date of the instrument in connection with which it to given)

Principal (Consultancy)

Surety (Bank)

Sum of bond (Express in words and figures)

Contract No.

And Date Of Contract

KNOW ALL MEN BY THESE PRESENTS, THAT WE, THE PRINCIPALS AND SURETY

above mentioned are held and firmly bound unto the Municipal Commissioner, AMC, Ahmedabad, owner of the work of **Misc. Repair and Maintainance works of Different Water Distribution Station of South West Zone and other zones in under Water Project Dept. A.M.C** called the "employer" in the amount stated for payment of which sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors jointly and severally, firmly by these presents subject to the provisions of which the afore said contract on demand and without demand on a claim being made by the "employer".

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the principals herein after called contractor viz. have entered into a contract with the Employer numbered and dates as shown above and hereto attached for the execution of work.

NOW THEREFORE, if the principal shall well and truly perform and fulfill all the under takings, covenants, terms, conditions and agreements, of said contract during the original terms of the said contract and any extensions thereof, they may be granted by the employer with or without notice to the surety and during the lift of any guarantee required under the contract and shall also well and truly perform, and fulfill all the undertakings, contract, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived or shall pay over, make good and reimburse to the employer all losses and damages which the employer may sustain by reason of failure or default on the part of said principal so to do.

We _____ further agree that guarantee herein contained shall remain in full force and affect during the period that would be taken for the validity _____ of the said contract and that it shall continue to be enforceable till all the dues of the employer under or by virtue of the contract have been fully paid and its claims satisfied or discharged or till the Employer certifies that the terms and conditions of the contract have been fully and properly carried out by the said contractor and accordingly discharges the guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____ we shall be discharged from all liability under this guarantee thereafter.

IN WITNESS WHEREOF the above bounded parties have executed this instrument under their several on the date indicated above the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In the presence of witness

	Individual	Principal
1.	as to	(Seal)
2.	as to	(Seal)
3.	as to	(Seal)
4.	as to	(Seal)

Affix

By

Corporate
Seal

Attested

Corporate Surety

Business Address

Affix

By

Corporate
Seal

Title

For and on behalf of the employer

AHMEDABAD MUNICIPAL CORPORATION
LIST OF APPROVED BANKS



અમદાવાદ મ્યુનિસિપલ કોર્પોરેશન

નાણાંખાતું,

બી-બ્લોક, પહેલો માળ, સરદાર પટેલ ભવન, દાણાપીઠ, અમદાવાદ.



નાણાં ખાતું

સરકયુલર નં.- 03

તા.28/04/2023

સંદર્ભ :- નાણાં ખાતાના સરકયુલર નં. ૧૦.તા.૦૧/૦૬/૨૦૨૨

આથી તમામ ખાતાના વડા અધિકારીશ્રીઓ/એકાઉન્ટશ્રી તથા બિલકલાર્કશ્રીને જણાવવામાં આવે છે કે, સિક્યુરિટી ડીપોઝીટ તેમજ અર્નેસ્ટમની ડીપોઝીટ સ્વીકારવા બાબતે રાજ્ય સરકારશ્રી દ્વારા મંજૂર થયેલ બેંકોની યાદીમાં નાણાં વિભાગના જી.આર. નં. EMD/4/2022/0002/ DMO Dt. 20/05/2022 મુજબ સુધારો કરી નવી યાદી બહાર પાડવામાં આવેલ છે.

રાજ્ય સરકારશ્રીના નાણાં વિભાગના જી.આર. EMD/4/2022/0002/ DMO Dt. 20/05/2022 દ્વારા સિક્યુરિટી ડીપોઝીટ તેમજ અર્નેસ્ટમની ડીપોઝીટ માટે મંજૂર થયેલ બેંકોની યાદી અંગે ડે.મ્યુનિ.કમિશનરશ્રી(નાણાં)ની મળેલ મંજૂરી ઠ.નં. ૨૭ તા.૦૪/૦૩/૨૦૨૩ મુજબના સદરહુ પરિપત્ર પ્રસિધ્ધ થયા તારીખ બાદથી તા.૩૧/૦૩/૨૦૨૪ સુધી અથવા રાજ્ય સરકારશ્રી દ્વારા આ બાબતે અન્ય જી.આર પ્રસિદ્ધ કરવામાં આવે ત્યાં સુધી એનેક્સર-1 માં જણાવેલ બેંકોની બેંકગેરંટી સીક્યુરિટી ડીપોઝીટ તથા ઈ.એમ.ડી. સ્વરૂપમાં સ્વીકારવામાં આવશે.

અમદાવાદ મ્યુનિસિપલ કોર્પોરેશનના તમામ ખાતાઓ દ્વારા મેળવવામાં / સ્વીકારવામાં આવતી બેંક ગેરંટીની ઓથેન્ટીસીટીની અધિકૃત ચકાસણી કરીને / કરાવીને જરૂરિયાત મુજબના કન્ટ્રોલ પ્રોસીજર સેટઅપ કરવાના રહેશે. તેમજ સરકારશ્રીના જી.આર અન્વયે ડે. મ્યુનિસિપલ કમિશનરશ્રી (ફાયનાન્સ) ની મળેલ મંજૂરી મુજબ માત્ર અમદાવાદ શહેરની તથા અમદાવાદ સિવાયના અન્ય શહેરની હોય અને તે બેંક ગેરંટી અમદાવાદ સ્થિત સંબંધિત બેંકની શાખા દ્વારા અધિકૃત કરાયેલ હોય તો નીચે જણાવેલ બેંકોની શાખાઓની બેંક ગેરંટી સ્વીકારવામાં આવશે. નાણાંખાતા દ્વારા ઉપરોક્ત સંદર્ભમાં જણાવેલ પરિપત્રોની અન્ય તમામ શરતો યથાવત રહેશે.

ANNEXURE – I

C. Guarantees issued by following banks will be accepted as SD/EMD on permanent basis.

❖ **All nationalized Banks**

D. Guarantees issued by following banks will be accepted as SD/EMD for the period up to March- 31, 2024. The validity cut-off date in the GR is with respect to the date of issue of Bank Guarantee irrespective of the date of termination of Bank Guarantee.

1 Commercial Banks :-

1. A U Small Finance Bank
2. Axis Bank
3. City Union Bank
4. DBS Bank India Limited
5. DCB Bank
6. Equitas Small Finance Bank
7. Federal Bank
8. HDFC Bank
9. ICICI Bank
10. IndusInd Bank
11. Kotak Mahindra Bank
12. Standard Chartered Bank
13. Tamilnadu Mercantile Bank
14. Bandhan Bank
15. BNP Paribas
16. CSB Bank
17. HSBC Bank
18. Karnataka Bank
19. Krur Vysya Bank
20. South Indian Bank
21. Utkarsh Small Finance Bank

2 Co-operative and Rural Banks Of Gujarat :-

1. The Ahmedabad Mercantile Co-operative Bank Limited
2. Kalupur Commerical Co-operative Bank Limited
3. Nutan nagrik Sahakari Bank Limited
4. Rajkot Nagarik Sahakari Bank Limited
5. Saraswat Co-operative Bank
6. Saurashtra Gramin Bank
7. The Gujarat State Co-Operative Bank
8. The Mehsana Urban Co-operative Bank Limited
9. The Surat District Co-operative Bank
10. The Surat Peoples Co-operative Bank
11. SVC Co-operative Bank LTD.

સહી: ચીફ એકાઉન્ટન્ટ

A-5: QUALIFICATION CRITERIA FOR TENDERERS

SECTION : A-5

Eligibility Criteria

Qualification will be based on meeting all the following minimum pass/fail criteria regarding the bidder's general and particular experience, personnel and equipment capabilities, and financial position, as demonstrated by the bidder's responses in the forms attached. The bidder should be registered in '**D**' class with AMC, State and Central Government and other Corporations / Boards. The AMC reserves the right to waive minor deviations, if they do not materially affect the capability of a bidder to perform the contract. Sub-contractor's experience and resources shall not be taken into account in determining the bidder's compliance with the qualifying criteria.

Financial Criteria:

- (1) The bidder shall have the financial capability and having an average annual turnover of last three years of minimum 30% of the estimated cost. Bidder also to enclose reports on its financial standing, such as profit and loss statements and auditor's reports, for the past three years.

Note: Financial turnover of previous years shall be given weightage of 10% per year based on rupee value to bring them to 2023-24 price level.

- (2) The audited balance sheets for the last three years shall be submitted.
- (3) The net worth shall be positive as of last financial year ending 31st March.
- (4) **Bid capacity** – Bidders, who meet the minimum qualification criteria, shall be qualified only if their available bid capacity is more than the total estimated value of the works for which he has offered his bid (**Appendix-C**). The available bid capacity will be calculated as under:

Assessed available bid capacity = $(2 \times A \times N - B)$

Where,

- | | | |
|---|---|--|
| A | = | Maximum value of works executed in any one year during the last three years (updated to 2023-2024 price level) taking into account the works completed as well as works in progress. |
| N | = | Number of years prescribed for completion of the works for which bids are invited. |
| B | = | Value, at 2023-2024 price level, of existing commitments and on going works to be completed during the 'N' years. i.e. 2 years |

Note: The statements/certificate showing the value of existing commitments and ongoing works as well as the stipulated period of completion remaining for each of the works listed should be provided. **The bidder shall submit an undertaking on Rs. 300/- Stamp Paper declaring that the details submitted by bidder are correct.**

- (5) Contractor should have registration with employees provident fund organization.

Note: Financial turnover and cost of completed works of previous years shall be given weightage of 10% per year based on rupee value to bring them to 2023-24 price level.

Following enhancement factors will be used for the cost of works executed and the financial figures to a common base value for works completed in India. For works completed abroad the latest currency conversion rate will be applied Enhancement factor will be applied from the next year of completion of work.

	Financial Years		Multiplying Factor Actual
Base year of inviting tender (2023-2024)	Last date of submission		
	One year	2025-2026	1.00
	Two year	2024-2025	1.10
	Three year	2023-2024	1.21
	Four year	2022-2023	1.33
	Five year	2021-2022	1.46
	Six year	2020-2021	1.61
	Seven year	2019-2020	1.77

Applicant will indicate actual figures of costs and amounts in the schedule without accounting for the above mentioned factors.

Solvency Certificate of an amount 20 % of the tender estimated cost shall be enclosed with technical bid. Bank Solvency shall not be older than one-year period as on the last day of the month previous to the one in which Tender are invited. If he fails to produce such certificate his tender will not be considered.

General Experience

The bidder shall meet with following minimum criteria:

- i) The bidders shall have the financial capability and having annual average turnover for last 3 years should be minimum 30% of the estimated cost.
- ii) Experience of having successfully completed similar works (Maintenance and Miscellaneous Repairing work in Water Distribution Stations & Building work) in last 7 (seven) years as under:-
 - a. Three similar completed works ((Maintenance and Miscellaneous Repairing work in Water Distribution Stations & Buildings work) each costing not less than the amount equal to 40% of the estimated cost.
Or
 - b. Two similar completed works ((Maintenance and Miscellaneous Repairing work in Water Distribution Stations & Buildings work) each costing not less than the amount equal to 50% of the estimated cost.
Or
 - c. One similar completed works ((Maintenance and Miscellaneous Repairing work in Water Distribution Stations & Buildings work) each costing not less than the amount equal to 80% of the estimated cost.

Note:

Please note that only tender fees, EMD, registration certificate, Affidavits, Undertaking / MOU and Addenda shall be submitted in hard copy with bidder forwarding letter in sealed envelopes.

Copies of Similar type of works carried, works on hands, details of technical Personnel, financial capacity, bidding capacity and required details in Schedules(Format) given in Section-B6 and all other required tender documents for tender evaluation duly filled as specified in tender must be uploaded Online.

Technical Bid in Hard copy shall be submitted only by Successful bidder's upon intimation from AMC."

The Technical envelop (comprising of EMD & Tender Fees, registration certificate, Affidavits, Undertaking and Addenda only) shall be submitted in sealed envelopes as described, so as to reach on or before the date and time mentioned in tender notice by Registered AD Post/ Speed Post/ Hand Delivery/ Courier.

Solvency Certificate

Solvency Certificate of an amount 20 % of the tender estimated cost shall be enclosed with technical bid. Bank Solvency shall not be older than one-year period as on the last day of the month previous to the one in which Tender are invited. **If he fails to produce such certificate his tender will not be considered.**

Joint Ventures -Delete

LITIGATION HISTORY:

The bidder should provide accurate information on any litigation history or arbitration resulting from contracts completed or under execution by him over the last ten years. This should also include such cases, which are in process / progress. A consistent history of awards against the bidder may result in failure of the bid. In case the bidder has not provided such information and has come to the notice of the authority, the tender will be rejected at what so ever stage and in such case all the losses that will arise out of this issue will be recovered from the tenderer / contractor and he will not have any defense for the same .

Municipal Commissioner, AMC reserves the right to accept or reject any or all the tenders without assigning any reasons and also reserves the right to ask the agency for submission of any data which requires after bidding.

THE BIDDER SHALL HAVE TO FULFILL THE ENTIRE MINIMUM REQUIREMENTS AS MENTIONED ABOVE FOR ALL THE CRITERIA OF FINANCE, EXPERIENCE AND TECHNICAL. TECHNICAL EVALUATION WILL BE MADE ON PASS / FAIL BASIS.

ONE BID PER BIDDER

- a) Each bidder shall submit only **one bid**. A bidder who submits or participates in **more than one bid will cause all those bids to be rejected**.

COST OF BIDDING:

- a) The bidder shall bear all costs associated with the preparation and submission of its bid and the Employer will in no case be responsible or liable for those costs.

SITE VISIT:

- a) The bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into a contract for the design-build and completion of the Works. The costs of visiting the Site / testing if required or any other cost shall be at the bidder's own expense.
- b) The bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such inspection, but only upon the express condition that the bidder, its personnel and agents, will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of the inspection.
- c) The Employer may conduct a site visit concurrently with the pre-bid meeting, if possible.

Contractor' Sign
Date:-

Additional City Engineer
(Water Project)

APPENDIX – K

**DETAILS OF SKILLED, UNSKILLED AND OTHER CATEGORIES
OF PERSONNEL / WORKERS
TO BE EMPLOYED FOR THIS CONTRACT

(QUARTERLY PROGRESS REPORT TO BE SUBMITTED
BY THE CONTRACTOR)**

Sr. No.	Description of Category	No.	Remarks
1.	Skilled		
2.	Un Skilled		
3.	Other Personnel / Workers		

:

SECTION : B

B-1: SPECIAL INSTRUCTIONS TO TENDERERS

B-2 : GENERAL CONDITIONS OF CONTRACT

B-3 : SCHEDULE – ‘B’

B-4 : GENERAL INSTRUCTIONS

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SECTION - B : GENERAL CONDITIONS OF CONTRACT

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B-1: SPECIAL INSTRUCTIONS TO TENDERERS (FORM B – 2)

SECTION: B-1

AHMEDABAD MUNICIPAL CORPORATION

Percentage Rate Tender and Contract for Works

Name of Work: Misc. Repair and Maintainance works of Different Water Distribution Station of South West Zone and other zones in under Water Project Dept. A.M.C

Division : AMC (Water Project)

Last date of acceptance of tender online: **As per tender inviting Notice.**

Issued to:

Opened by: AMC

Date:

Additional City Engineer (Water Project)
Ahmedabad Municipal Corporation

NOTICE INVITING TENDERS

1. Tenders are invited for and on behalf of Municipal Commissioner (AMC) for **Misc. Repair and Maintainance works of Different Water Distribution Station of South West Zone and other zones in under Water Project Dept. A.M.C**
2. The works are required to be completed within **12 (Twelve)** months including monsoon period as per the terms of the contract conditions.
3. The Contractors whose names are borne of the approved list of Contractors with AMC, State and Central Government and other Corporation and Boards in '**D**' class and above will be permitted to tender. Not more than one tender shall be submitted by a Contractor or by a firm of Contractors. No two or more concerns in which an individual is interested as a proprietor/or partner shall tender for the execution of the same works. If they do so, all such tenders shall be liable to be rejected.
4. Tenderers are advised to visit the site sufficiently in advance of the date fixed for submission of the tender. A tenderer shall be deemed to have full knowledge of all the relevant documents, samples, site etc., whether he inspects them or not.
5. Submission of a tender by a tenderer implies that he has read this notice and all other contract documents and has made himself aware of the scope and specification of the work to be done and of conditions and rates at which stores, tools and plant etc., will be issued to him by Government and local conditions and other factors bearing on the execution of the works.
6. A tenderer should quote in figures as well as in words the percentage of rate tendered. The amount should be worked out and the requisite total given.
7. Percentage shall be quoted online.
8. The tender for the works shall not be witnessed by a Contractor or Contractors who himself/themselves has/have tendered or who may and has/have tendered for the same works. Failure to observe this condition shall render the tender of the contractor tendering, as well as of those witnessing the tender, liable to rejection.
9. Tender shall be received online as explained earlier.
10. The tender shall be accompanied by earnest money of **Rs. 79665/-** by Demand Draft / Bank Guarantee/Pay Order issued in favour of Municipal Commissioner by a scheduled bank or from banks as per the list attached of approved banks of Ahmedabad Municipal Corporation the amount being credited to Ahmedabad Municipal Corporation.

- 11.** A tenderer shall submit the tender which satisfies each and every condition laid down in this notice and tender documents, failing which, the tender will be liable to be rejected.
- 12.** The Ahmedabad Municipal Corporation does not bind himself to accept the lowest or any tender or to give any reasons for his decision.
- 13.** This notice of tender shall form part of the contract documents.

For and on behalf of Ahmedabad Municipal Corporation

Date.....

Signature.....

Designation.....

ADDITIONAL INSTRUCTIONS TO PERSONS TENDERING

1. Competency of Tenderer–

No contract will be awarded except to responsible bidders capable of performing the class of work contemplated. Before the award of the contract, any bidder may be required to show that he has the necessary facilities, experience, ability and financial resources to perform the work in satisfactory manner within the time stipulated. Contractor may be required to furnish the corporation with the statement as to their experience and their financial status.

2. Tenderer will be deemed to have inspected the site and to have satisfied himself as to the nature of all works, all existing roads, water-way and other means of communication and access to and from the site and work and the building that may be required for temporary purpose in connection with the construction, completion and maintenance of the works and must make his own enquiries as to work, yard sites and depot, and dumps and as to acquisition of such additional sites and areas as may be necessary for temporary purpose for constructing, completing and maintaining the works.

The tenders shall be received under “Registered Post or Speed Post or Courier or Hand Delivery

- (i) Late tenders (i.e. tender received after the specified time of opening), delayed tenders (i.e. tenders received before the time of opening but after due date and time of receipt of tenders) and post tender offers shall not be opened and considered at all.
- (ii) The tenders received (by registered post) after the time and the date specified in the tender notice shall not be received by the concerned office from the postmen, for which, date and time may be recorded on the cover of the tender as to when tender was refused by the Assistant Manager or the Administrative Head or any other person incharge.
- (iii) Necessary records should be maintained for refusal of such tenders in the registers for receiving tenders and should be initialed by the Addl. City Engineer (Water Project)

3. Payment-

The tenderer must understand clearly that the percentage rates quoted are for completed works and include all costs due to labour, scaffolding plant, supervision, service work, power, taxes, royalties and octroi etc. and to include all extras to cover the cost of night work if and when required and no claim for additional payment beyond the price/rates quoted will be entertained and the tenderers will not be entitled subsequently to make any claim on the ground of misrepresentation or on the ground that he was supplied with information given by any person (whether the member is the employee of Ahmedabad Municipal Corporation or not). Any failure on his part to obtain all necessary information for the purpose of making his tender and filling the percentage rates therein shall not relieve him from any risks or liabilities arising out of or consequent upon the submission of the tender.

4. Tender Forms–

Every 'blank' in the form of tender and in the schedule must be filled up by the tenderer and must return the document sent herewith.

5. Erasures-

Persons tendering are informed that no erasures or alterations by them in the text of the document sent herewith will be allowed and any such erasures or alterations will be disregarded. If there is any error in writing, no overwriting should be done, the wrong word or a figure should be struck out and the correct one written above or near it in unambiguous way. Each correction should be initialed.

Contractors to Please Read This Carefully:

1. The Percentage in **Schedule 'B'** must be given in words and figures. Amount thus worked out must also be entered in column.
2. If the tender is taken in favour of the company, a power of attorney in favour of the person who may have signed the tender for the company must accompany the tender.
3. Solvency certificate of a Bank or a Revenue Officer of an amount upto 20% of the tendered cost plus the amount of works on hand still to be executed will have to be produced by the Contractor.
4. Challan for earnest money of **Rs. 79665/-** must accompany the tender. The amount of earnest money can be offered by the contractor, at his choice, in the form of Bank Guarantee/Demand Draft of the scheduled bank or from banks as per the list attached of approved banks by Ahmedabad Municipal Corporation.

If the contractor do not turn up to pay the Security Deposit and execute contract agreement within specified (or extended) time after intimation to him amount acceptance of his offer, the earnest money paid for this work will be forfeited and his registration will be held in abeyance for three years.

DECLARATIONFORM

- (i) I/ We hereby declare that I / We have visited the site and fully acquainted myself / ourselves with the local situations regarding materials, labour and other factors pertaining to the work before submitting this tender.
- (ii) I / We hereby declare that I / We carefully studied the conditions of contract, specifications and other documents of this work and agree to execute the same accordingly.

Declaration Certificate

- (iii) I / We hereby declare that my / our near relatives are not working in Ahmedabad Municipal Corporation as an Additional City Engineer, Dy. City Engineer, Assistant City Engineer, Assistant Engineer, Additional Assistant Engineer, Supervisor, Overseer, Divisional Accountant, Store Keeper, Manager as on today.

GENERAL RULES AND DIRECTIONS FOR THE GUIDANCE OF CONTRACTORS

- 1.0 All works proposed to be executed by the contractor shall be notified in a form of invitation to tender pasted on a board hung up in the office of the Addl. City Engineer (Water Project) and signed by him.

This form will state work to be carried out as well as the date of submitting and opening tenders and the time allowed for carrying out the work also the amount of earnest money to be deposited with the tender and the amount of the security deposit to be paid by the successful tenderer and percentage, if any, to be deducted from bill. It will also state whether a refund of quarry fees, royalties, octroi dues and ground rents will be granted. Copies of the specifications, designs and drawings and estimated rates, and any other documents required in connection with work which shall be signed by the Addl. City Engineer (Water Project) for the purpose of identification, shall also be open for inspection by contractors at the office of the Addl. City Engineer (Water Project) during office hours.

Where the works are proposed to be executed according to the specifications recommended by a contractor and approved by a competent authority on behalf of the Ahmedabad Municipal Corporation, such specifications with designs and drawings shall form part of the accepted tender.

- 2.0 In the event of the tender being submitted by a firm, it must be signed separately by each partner thereof or in event of the absence of any partner it shall be signed on his behalf by a person holding a power of attorney authorizing him to do so. Details of partners will be furnished in Annexure – 1 along with the copy of partnership deed.
- 3.0 Receipts for payment made on account of any work, when executed by a firm, shall also be signed by all the partners except where the contractors are described in their tender as a firm in which case the receipts shall be signed in the name of the firm by one of the partners or by some other person having authority to give effectual receipts for the firm.

Tender will be submitted online.

- (a) All preliminary & technical details required online shall be submitted. The other documents required in hard copy shall be submitted to AMC in sealed envelope before prescribed date.
- (b) If any price bid contains any conditions the same shall have to be rejected outright. Document of payment of earnest money or exemption certificate should accompany the technical bid cover.
- (c) The technical bids in sealed cover duly completed as above should be submitted by the “Registered post Acknowledgement Due or by Speed Post or by Courier or By Hand Delivery. (only for L-1 Tenderer when asked)
- (d) The bidders shall clearly indicate deviations (s) from specifications or the tender conditions very explicitly in the appropriate section and submit a copy of the same with the technical bid. It should be very clearly understood by all tenderers that the technical bid should be restricted only to technical matters and stipulations of conditions, if any, by tenderer having financial implications. The prices of main tender should not be disclosed in the technical bid.

- (e) The technical bid will be opened first in the presence of those bidders who remain present. The time and date of opening of price bids will be determined by the officer who opens the tender, and the same will be intimated to the bidders, if required after the technical bid proposals are opened and analyzed and all clarifications / price variations, if any, obtained.
- (f) The conditions specified in technical bid should invariably be accompanied by proper financial evaluation with mode of calculation specifying assumptions, quantities, rate and ceiling amounts for each condition and shall also accompany the information in the form stating (a) Sr. No. (b) Description of the condition (c) financial evaluation (vide R & B D.G.R. No. / TNC / 7777 / 281-C dated 30-09-92 (d) ceiling amount to be added in price bid, on case condition is not accepted.
- (g) Ceiling amounts shall be binding on the contractors and are liable to be added to the tender amount.
- (h) It is necessary that the contractor or his authorized representative remains present at the time of opening of technical bid as specified in (e) above, so that wanting details and clarifications in respect of conditions can be furnished by him or conditions withdrawn on the spot by him. If the technical bid is incomplete in respect of any of the details referred to in sub-clauses 2 (f) above, and the contractor does not furnish the wanting details as required above on the spot in the presence of other bidders after opening the technical bid, the tender would be liable to rejection.
- (i) The evaluation as given by the contractor as modified by tender opening authority with the ceiling limit will then be intimated to all the bidders who remain present and then, if convenient, the price-bid shall be opened on the same day and the combined evaluation of the tender of price bid and the technical bid would be worked out. No further opportunity shall be given to the Contractors to modify / withdraw conditions at that stage as the price bid would be known to all. Ahmedabad Municipal Corporation however, reserves the right to negotiate about the tender (s) further with any or all the contractors. In case the price bids cannot be opened on the same day then another date will be intimated to the tenderers as in para (e) above.

5.0 The Addl. City Engineer (Water Project) or his duly authorized. Assistant shall open tenders in the presence of any intending contractors who have submitted tenders or their representatives who may be present at the time and he will enter the amounts of the several tenders in a comparative statement in an suitable form. In the event of a tender being accepted, the contractor shall, thereupon, for the purpose of identification, sign copies of the specifications and other documents mentioned in this tender. In the event of tender being rejected, the Officer shall authorize the Officer concerned to refund the amount of the earnest money deposited, to the contractor making the tender on his giving a receipt for the return of the money.

6.0 The Officer competent to dispose of the tenders shall have the right of rejecting all or any of the tenders.

- 7.0 No receipt for any payment alleged to have been made by a contractor in regard to any matter relating to this tender of the contract shall be valid and binding on Corporation unless it is signed by the Addl. City Engineer (Water Project)
- 8.0 The memorandum of the work to be tendered for and the schedule of materials to be supplied by Ahmedabad Municipal Corporation and their rates shall be filled in and completed by the office of the Addl. City Engineer (Water Project) before the tender form is issued. If a form issued to an intending tenderer has not been so filled in and completed, he shall request the said officer to have this done before he completes and delivers his tender.
- 9.0 All works shall be measured net by standard measure and according to the rules and customs of the Ahmedabad Municipal Corporation without reference to any local custom.
- 10.0 Under no circumstances shall any contractor be entitled to claim enhanced rate for any items in this contract.
- 11.0 Every contractor shall, unless exempted in writing by the Concerned Engineer, produce along with his tender a solvency certificate of his financial ability from the collector of the District within which he resides or a Banker's certificate. If he fails to produce such a certificate his tender will not be considered.
- 12.0 All Corrections and additions or pasted slips should be initialed.
- 13.0 The measurements of work will be taken according to the usual method in use in the Ahmedabad Municipal Corporation and no proposals to adopt alternative methods will be accepted. The Addl. City Engineer (Water Project) decision as to what is 'the usual method in use in the Ahmedabad Municipal Corporation' will be final.
- 13.0- A The Insurance Company's bond will not be accepted against the security deposit.
- 14.0 The contractor shall have to attach to his tender Income – Tax Clearance Certificate to be obtained from the Income-Tax Officer.
- 15.0 The Contractor will have to construct a shed for storing controlled and valuable materials issued to him under Schedule 'A' of the agreement at work-site having double locking arrangement. The materials will then be taken for use in the presence of the AMC person. No materials will be allowed to be removed from the site of work.
- 16.0 No foreign exchange will be released by the Corporation for the purpose of plant and machinery required for the execution of the work contracted for.
- 17.0 Controlled materials (Essentiality Certificate)
- (1) As regards controlled materials, the Ahmedabad Municipal Corporation will help to arrange for the permit as far as possible and help the Contractor in securing the same. All incidental charges met with in procuring these materials shall be borne by the Contractor himself. Though the Ahmedabad Municipal Corporation will help to arrange for the permit as far as possible and help the Contractor in Obtaining the materials, it shall not accept any responsibility for any delay or loss on account of delay caused to the Contractor while obtaining the same.

- (2) The contractor shall submit to the Addl. City Engineer (Water Project) on close of every calendar month, the monthly returns in the prescribed forms as to the receipts and actual use of the controlled materials during the month.
 - (3) The contractor shall permit the Addl. City Engineer (Water Project) or his representatives to inspect the stock of the controlled materials stored by him at any time whenever the Addl. City Engineer (Water Project) or his representative(s) so desires(s).
- 18.0 The tender for the work shall remain open for a period of 120 days from the stipulated date of receiving the tenders for this work and that the tenderer shall not be allowed to withdraw or modify the offer on his own after handing over the tender to the postal authorities for dispatch during this period. If any tenderer withdraws or makes any modifications, or additions in the terms and conditions of this tender not acceptable to the Ahmedabad Municipal Corporation then the Corporation shall, without prejudice to any right remedy, be at liberty to forfeit in full the said earnest money absolutely. In this connection G. R. R. and BD No. TNC-IIB-22-(10)-C dated 14-8-90 should be referred to.
- 19.0 The contractor shall employ only such labourer who shall produce a valid certificate of having been vaccinated against small pox within a period of last three years.
- 20.0 (1) If the members of Labour Co-operative Societies do not work themselves and obtain commission by subletting the work, as a whole or by dividing work in groups and give work to piece workers, the very purpose of the scheme would be defeated. Therefore the Labour Co-operative Societies will not sublet the work and the work will be executed by the member labourers of the society
 - (2) In case where the works required to be carried out by the labourers other than the members of the Labour Co-operative Societies with the man days more than 25% prior permission of the Addl. City Engineer (Water Project) will be necessary.
 - (3) The Labour Co-operative Societies shall have to allow the officers of the Corporation to examine for audit purpose the muster rolls as and when required.
 - (4) Labour Co-operative Societies shall have to submit a quarterly return stating the monthly attendance of man days on the muster rolls of member labours on each work to the Addl. City Engineer (Water Project)
 - (5) If the Labour Co-operative Society is found violating the terms and conditions mentioned above the labour Co-operative Society will be liable for the cancellation of work contract and or registration as decided by the Addl. City Engineer (Water Project)
- 21.0 Immediately after issue of the work order for the said works the contract shall display the board showing brief details of the specifications on the site of work (R & B D Gr. No. TNC-1090 – 24- 3 dated 18-11-1991).

- 22.0 The buildings under the contract will not be occupied by the contractor for use of the labourers, staff or for any other purpose. In case of breach of this condition market rent will be recovered for the area unauthorized occupied.

TENDER FORWORKS

I/We hereby tender for the execution for the Ahmedabad Municipal Corporation (hereinbefore and hereinafter referred to as Corporation) of the work specified in the underwritten memorandum within the time specified in such memorandum at tendered percentage rates entered in Schedule 'B' (memorandum showing item of works to be carried out) and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to in this tender and in Clause 13 of the annexed conditions of contract and agree that when materials for the work are provided by Corporation, such materials and the rates to be paid for them shall be as provided in Schedule 'A' here to.

MEMORANDUM

1. Name of Work : Invitation of tenders (Two bid system)for
Misc. Repair and Maintainance works of Different Water Distribution Station of South West Zone and other zones in under Water Project Dept. A.M.C.
2. Earnest Money : **Rs.79665/-**
3. Validity Period : **120 Days** from the last date of Opening of Price Bid
4. Security Deposit : **5%ofthecontractvalueintheformofBankGuarantee / Demand Draft Bank guarantee shall be issued from Ahmadabad Branch Only as per paraA.4.24.**
5. Time– Limit : **12 (Twelve)Months** including of monsoon period

If the site is not cleared to start the work. The time limit will be consider from the date of possession given to start the work.

Delay due to Client Reason.
6. (i) Last date of submission of the tender online : **29-11-2023 up to 18.00hours**

ii) Mode of Sending : a)up to date: **24-06-2026**(document fees, EMD to be submitted in hardcopy person/RPAD/speed post/courier up to**16:00hrs.**)

iii) Description essential to be made on sealed cover: a) Name and No. of Work.

b) Date of receiving tender by corporations.

iv) Mode of quoting rates in Schedule of rates : Percentage in figures as well as in words.

Should this tender be accepted, I/We hereby agree to abide by and fulfill all the terms and provision of the conditions of contract annexed hereto so far as applicable and in default thereof to forfeit and pay to Corporation in Office the sums of money mentioned in the said conditions.

(Receipt No _____ dated _____ from the Ahmedabad Municipal Corporation office _____ in respect of sum ofRs.*_____ is forwarded herewith representing the earnest money + (a) the full value of which is to absolutely for

fitted to Ahmedabad Municipal Corporation should I/We do not deposit the full amount of security deposit in the above memorandum in accordance with Clauses 1(A) of the said conditions, otherwise the said sum of Rs. _____ shall be refunded.)

Contractor x _____

Dated theday of2023

(Witness)

Address.....

(Occupation)

The tender is hereby accepted by me on behalf of the Ahmedabad Municipal Corporation.

Dated the _____ day of _____ 2023

Addl. City Engineer (Water Project) (or his duly authorized Assistant).....Division

+ strike out (a) if no cash security deposit is to be taken

X Signature of the Contractor before submission of tender.

* Amount to be specified in words and figures

B-2: GENERAL CONDITIONS OF CONTRACT

SECTION: B-2

TERMS & CONDITIONS OF CONTRACT

Clause - 1: Security Deposit

The person / persons whose tender may be accepted (here-in-after called the 'Contractor' which expression shall unless excluded by or repugnant to the context include his heirs, executors, administrators and assignees) shall (within one day for a contract of Rs. 1,000 or less or 2 days for a contract of more than Rs. 1,000 but less than Rs. 2,000 and so on up to a limit of ten days which can be extended up to 15 days by the Concerned Dy. Municipal Commissioner, if he thinks it fit to do so for a contract of Rs. 10,000 or more of the receipt by him of the notification of the acceptance of his tender), deposit with the Municipal Commissioner in cash or Corporation securities endorsed to the Municipal Commissioner. Provided always that in the event of the Contractor depositing a lump sum by way of security deposit as contemplated above, then and in such case, if the sum so deposited shall not amount to 5 percent of the total contract value of the work, it shall be lawful for Municipal Corporation at the time of making any payment to the Contractor for work done under the contract to make up the full amount of 5 percent by deducting a sufficient sum from every such payment as last aforesaid until the full amount of the security deposit is made up. All compensation or other sums of money payable by the Contractor to Municipal Corporation under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising there from, or any sums which may be due or may become due by Municipal Corporation to the Contractor on any account whatsoever, and in the event of his security deposit being reduced by reason of any such deduction or sale as aforesaid, the Contractor shall, within ten days thereafter, make good in cash or Government securities endorsed as aforesaid any sum or sums which may have been deducted from or realized by sale of his security deposit or any part thereof. The security deposit referred to, when paid in cash may, at the cost of the depositor, be converted into Interest Bearing Securities provided the depositor has expressly desired this inwriting.

If the amount of the security deposit to be paid in a lump within a period specified above is not paid, the tender / contract already accepted shall be considered as canceled and legal steps shall be taken against the contractor for recovery of the amounts. Security Deposit shall be converted into the Performance Guarantee Bond Valid for the entire defect liability period to be executed by the contractor after completion of the work and certificate of completion issued by Engineer that effect after deducting there from the amount of expenses if any due to Municipal Corporation under this agreement.

Clause - 2: Liquidated damages for delay

(i) If the Contractor fails to complete the work under contract by the stipulated date, he shall pay liquidated damages of 10 percentage of the remaining value of work from the date of delaying the said work up to the date of completion and handing over to the Ahmedabad Municipal Corporation.

(ii) Delays for requiring payment of ten percentage liquidated damages of the remaining amount of tender work for performance shall be sufficient for termination of contract and forfeiture of security deposit including amount of performance bond in respect of works estimated to cost more than Rs.15 lacs of performance and registration of the contractor shall also be kept in abeyance for three years from the date as fixed on all cases.

(iii) Further to above, AMC may take actions such as recovery by revenue ways and / or else. Black listing the Contractor permanently and will inform all other Govt. / Semi Govt. / Corporations / boards / Municipalities / Nagar palika departments

(iv) If the contractor has gone against AMC for litigation or Arbitration for any reasons whatsoever, the contractor will not be considered for the works after that date i.e. contractor will be disqualified for the works after that date. Before proceeding for Black listing the contractor, AMC may consult Legal Department of AMC.

Clause - 3: Default by Contractor:

If the Contractor shall neglect or fails to proceed with the work with due diligence or if he violates any of the provision of the Contract, the Engineer-in-Charge shall give the Contractor a notice, identifying deficiencies in performance and demanding corrective action. Such notice shall clearly state that it is given under the provision of this clause. After service of such notice, the Contractor shall not remove any plant, equipments and materials from the site. The Ahmedabad Municipal Corporation shall have a lien on all such plant, equipments and materials from the date of such notice till the said deficiencies have been corrected as mentioned in the said notice.

If the Contractor fails to take satisfactory corrective action within ten days after receipt of such notice, the Engineer-in-charge on behalf of Ahmedabad Municipal Corporation shall terminate the contract in whole. In case, the entire contract is terminated, the amount of security deposit and performance bond if any together with the value of the work done but not paid for, shall stand forfeited to the Ahmedabad Municipal Corporation. The plants equipment and material held under this clause shall then be at the disposal of the Ahmedabad Municipal Corporation to recover the amount equivalent to the liquidated damages and registration of the Contractor shall be kept in abeyance for three years from the date as fixed in all such cases.

The Engineer-in-Charge if necessary shall direct that a part or the whole of such plant, equipment and material be removed from the site within a stipulated period. If the Contractor fails to do so, the Engineer-in-Charge shall cause them or any part of them to be sold holding the net proceeds of such sale to the credit of the Contractor. After settlement of accounts, the lien by the Ahmedabad Municipal Corporation on the Contractors remaining plant, equipments and balances of materials shall be released.

Termination of the contract in whole shall be adequate authority for the Engineer-in-Charge to demand discharge of the obligations from the guarantors of the security for the performance.

Clause – 4 : If the progress of any particular portion of the work under Contract is unsatisfactory, the Engineer-in-Charge shall, notwithstanding that the general progress of the work is satisfactory, in accordance with clause 2, be entitled to take necessary action under Clause 3, after giving the Contractor ten day's notice in writing and the Contractor shall have no claim whatsoever for any compensation for

any loss caused to him due to such action.

(Clause 1, 2, 3 and 4 are substituted vide GR No. TNC – 1091/IB-10/(11)-C, dated 15-10-91 & modified by GR dated 29-10-91) and GR No. TNC-1088/1B/18/(B) –C dated 31-8-94 and No. TNC /10 / 2002/14-C dated 28-4-2003.

Clause – 5 :In any case in which any of powers conferred upon the Engineer-in-Charge by clause 3 hereof shall have become exercisable and the same shall not have been exercised, the non exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable at any future date.

Clause 5(i): Valuation at date of forfeiture

The owner shall as soon as may be practicable after his entry consequent upon the expulsion of the Contractor fix and determine expert or by or after reference to the parties or after such investigations or inquiries as he may think fit to take or institute and shall certify what amount (if any) which had at the time of such entry and expulsion become reasonably due to the Contractor in respect of work then actually done by him under the contract including the value of any unused or partially used materials, any constructional plant and any temporary works which are taken over by owner under his exclusive rights.

Clause 5(ii): Payment after Forfeiture

If purchaser shall enter and expel the Contractor under this clause, he shall not be able to pay the Contractor any money on account of the contract as determined as per the foregoing para together with the Contractor other dues until the expiry of the defects liability period and thereafter until the costs of completion and maintenance damages for delay in completion (if any) and all other expenses incurred by Purchaser have been ascertained and the amount thereof certified by the Architect, the Contractor shall then be entitled to receive only such sum of sums, (if any) as owner may certify. But if such amount due from the contractor

exceeds the sum payable to the Contractor, the Contractor shall upon demand pay to Purchaser the amount of such excess and it shall be deemed as debt due by the contractor to Purchaser and shall be recoverable accordingly.

Clause 5(iii): If the Contractor dies

Without prejudice to any of the rights or remedies under this contract, if the Contractor dies owner shall have option of terminating the contract without any compensation to the Contractor.

Clause 5(iv) : Insolvency and breach of contract

The AMC may at any time, by notice in writing, summarily terminate the contrast without compensation to the contractor in any of the following events:

- a) If the contractor, a firm or any partner thereof, shall be at the time adjusted insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceedings for composition under any insolvency act for the time being in force to make any conveyance or assignment of his assets or enter into any arrangement or composition with his creditors or suspend of payment if the firm is dissolved under the partnership Act.
- b) If the contractor being a company is wound up voluntarily by the order of a court or receiver, liquidator or Manager on behalf of the debenture holders is appointed or circumstances shall have arisen which entitled the court or Debenture holders to appoint a receiver liquidator or Manager.
- c) If the contractor commits any breach of the contract not herein specifically provided any right of action or remedy which shall have occurred or shall occur thereafter and provided also the contractors be liable to pay the AMC for any extra expenditure he is thereby put to and the contractor shall under no circumstances be entitle to any gain in repurchase.

- A **Clause – 5A :** In the event of the Engineer-in-Charge taking action under Clause 3, he may, if the so desires, take possession of all or any tools, plants, machineries, materials and stores in or upon the work or the site thereof or belonging to the Contractor or procured by him and intended to be used for the execution of the work or any part thereof, by paying or allowing for the same in account at the contract rate or in case of contract rates not being applicable at such reasonable rates, as may be comparable to current market rates where ascertainable of similar articles and comparable condition, to be certified by the Engineer-in-Charge. In the alternative the Engineer-in-Charge may by notice in writing to the Contractor or his clerk of the works, foreman or other authorized agent, require him to remove such tools, plants, machineries, materials or stores from the premises within a time to be specified in such notice and in the event of the Contractor failing to comply with any such requisition, the Engineer-in- Charge may remove them at the Contractor's expense or shall remove them by auction or private sale at the risk and cost of the Contractor in all respect, and the certificate of the Engineer-in-Charge as to the expenses of any such removal and

The amount of the proceeds and expenses of any such removal shall be final and conclusive against the Contractor.

Clause - 6 : Extension of time : If the Contractor shall desire an extension of the time for completion of the work on the ground of his having been unavoidably hindered in its execution or any other ground, he shall apply in writing to the Concerned Dy. Municipal Commissioner before the expiration of the period stipulated in the tender or before the expiration of 30 days from the date of which he was hindered whichever is earlier Concerned Dy. Municipal Commissioner may, in his opinion, believe that there are reasonable grounds for granting an extension, grant such extension, as he thinks necessary or proper. The decision of the Concerned Dy. Municipal Commissioner in this matter shall be final.

Clause – 7: As soon as the work is completed, the Contractor shall give a notice of such completion to the Engineer-in-Charge and on receipt of such notice, the Engineer-in-Charge shall inspect the work, and if he is satisfied that the work is completed in all respects then:–

- (i) For all works costing up to Rs. 50 lakhs (amount put to tender), the final measurements shall be recorded within 90 days from the date of physical completion of the work and the final bill shall be prepared within 45 days from the date of recording final measurements. The completion certificate shall be issued within one month from the date of final measurements subject to the Contractor fulfilling his obligation as provided in the contract and subject to the work being complete in all respect.
- (ii) In respect of works costing more than Rs. 50 lakhs (amount put to tender), the final measurements shall be recorded within 180 days from the date of physical completion of the work and the final bill shall be prepared within 75 days from the date of final measurements subject to the Contractor fulfilling his obligation as provided in the contract and subject to the work being complete in all respects.

When separate periods of completion have been specified for items or groups of items, the Engineer-in-Charge shall issue separate completion certificate for such items or groups of items.

No certificate of completion shall be issued nor shall the work be considered to be complete till the contractor shall have removed from the premises, on which the work has been executed, all scaffoldings, sheds and surplus materials, except such, as are required for rectification of defects, rubbish and all huts and sanitary arrangements required for his workmen on the site in connection with the execution of the work, as shall have been erected by the Contractor for the workmen and cleared all dirt from all parts of the building(s) in, upon or around which the work has been executed or of which he may have possession for the purpose of the execution thereof and cleared floors, gutters and drains, cased doors and sashes, oiled locks and fastenings, labeled keys clearly and handed them over to the Engineer-in-Charge or his representative and made the whole premises fit for immediate occupation or use to the satisfaction of the Engineer-in-Charge. If the Contractor shall fail to comply with any of the requirements of these conditions as aforesaid, on or before the date of completion of the work, the Engineer-in-Charge may, at the expense of the Contractor, fulfill such

Requirements and dispose of the scaffolding, or surplus materials and rubbish materials except for any sum actually realized by the sale thereof less the cost of fulfilling the requirement and any other amount that may be due from the Contractor. If the expenses of fulfilling such requirement pay such excess. The Engineer-in-Charge shall also have the rights to adjust the amount of excess against any amounts that may be payable to the Contractor.

Clause – 8 : No payment shall be made for any work, estimated to cost less than rupees one thousand till after the whole of the said work shall have been completed and a certificate of completion given. But in the case of works estimated to cost more than rupees one thousand, the Contractor shall, on submitting a monthly bill therefore, be entitled to receive payment proportionate to the part of the work then approved and passed by the Engineer-in-Charge, whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the Contractor. All such intermediate payments shall be regarded as payments by way of advance against the final payments only and not as payments for work actually done and completed and shall not preclude the Engineer-in-Charge from requiring bad, unsound, imperfect or unskilled work to be removed and taken away and reconstructed, or re-erected, nor shall any such payment be considered as an admission of the due performance of the contract or any part thereof if any other way very or effect the contract. The final bill shall be submitted by the Contractor within one month of the completion of the work, otherwise the Engineer-in-Charge's certificate of the measurements and of the total amount payable for the work shall be final and binding on all parties.

Clause – 9: The rates for items of works shall be valid only when the item concerned is accepted as having been completed fully in accordance with the sanctioned specifications. In cases where the items of work are accepted as not so completed, the Engineer-in-Charge may make payment on account of such items at such reduced rates as he may considered reasonable in preparation of final or on account bill.

Clause – 10: Bills to be submitted monthly

For the works costing above Rs.10,00,000 payment will be made once in a month. However, another payment will be made as desired by contractor and as agreed by AMC.

Clause – 11: The Contractor shall submit all the bills on the printed forms to be had on application at the office of the Engineer-in-Charge. The charges to be made in the bills shall always be entered at the rates specified in the agreement or at the part/reduced rates subject to the approval by the Engineer-in-Charge in the case of items not completed/executed as per agreements or in the case of any extra work ordered in pursuance of these conditions and not mentioned or provided for in the tender, at the rate hereinafter provided for such work.

Clause – 12 : If the specification of estimate of the work provides for the use of any special description of materials to be supplied from the Departmental Store of Ahmedabad Municipal Corporation or if it is required that the Contractor shall use certain stores to be provided by the Engineer-in-Charge (such materials and stores

and the prices to be charged therefore as hereinafter mentioned being so far as practicable for the convenience of the Contractor but not so as in any way to control the meaning or effect of this contract specified in the schedule or memorandum herein annexed) the Contractor shall be supplied with materials and stores as may be required from time to time to be used by him for the purpose of the contract only, and the value of the full quantity of materials and stores so supplied shall be set off or deducted from any sum then deposit, or thereafter to become due to the Contractor under the contract, or otherwise, or from the security deposit, or the proceeds of sale thereof; if the deposit is held in Ahmedabad Municipal Corporation securities/Bank Guarantee/ Cash/ Bank Draft the same or a sufficient portion thereof, shall, in that case be sold for the purpose. All materials supplied to the Contractor shall remain the absolute property of Ahmedabad Municipal Corporation and shall, on no account, be removed from the site of the work, and shall at all time, be open to inspection by the Engineer-in-Charge. Any such materials, unused and in perfectly good condition at the time of completion or termination of the contract, shall be returned to the Departmental store if the Engineer-in-Charge so requires by a notice in writing given under his hand, but the Contractor shall not be entitled to return any such materials except with the consent in writing of the Engineer-in-Charge and he shall have no claim for compensation on account of any such material supplied to him as aforesaid but remaining unused by him or for any wastage in or damage thereto.

For materials provided in Schedule-A and consumed in excess quantities, the rates provided in Schedule – A shall be increased / decreased corresponding to the increase/decrease in the new rate payable for excess quantity as compared to the tender rates. The rate for materials provided in extra items will be the issue rates plus storage charges ruling on the date of issue of such quantity of materials.

B.2.12A Clause – 12A : The Contractor shall be entitled to use the materials supplied by the Corporation only to the extent of quantities of such materials required for execution of the work as per theoretical calculations. The Engineer-in-Charge may, however, on being satisfied that a large quantity of such materials is required for the execution of the work, permit the Contractor to use such larger quantity of the materials. Such permission shall be given in writing.

The Contractor is bound to return in good condition such materials issued in excess of the requirements so worked out or in excess of the quantities so permitted to be used by the Engineer-in-Charge. If the Contractor fails to return such extra materials within a period of 15 days from the date of demand in writing of such materials being made by the Engineer-in-Charge, he shall be charged for the excess materials at double the issue rate for such materials specified in “Schedule A” of the contract Agreement.

B Clause – 12B: All stores and materials such as cement, if the total consumption of which exceeds 25 tons, and steel etc, supplied to the Contractor by Ahmedabad Municipal Corporation shall be kept by the Contractor in separate godown provided with a double lock. The key of one of the lock shall remain with the Engineer-in-Charge or his agent. The godown shall be accessible to the Engineer- in-Charge or his agent at all times. No materials shall be allowed to be removed from the site of the work, and any material required for the execution of the work

Shall be taken out from the godown only in the presence of a duly authorized agent of the Engineer-in-Charge.

Clause – 13:

- (1) The Contractor shall execute the whole and every part of the work in the most substantial and workman-like manner and both as regards materials and in other respect in strict accordance with specifications.

The Contractor shall also conform exactly, fully and faithfully to the designs, drawings and instructions in writing to the work signed by the Engineer-in-Charge. The design and the drawings shall be lodged in the office of the Engineer-in-Charge to which the Contractor shall be entitled to have access for the purpose of inspection at such office during office hours.

Where the instructions referred to above are not contained in separate letters addressed to the Contractor the same shall be recorded in the work order book, which shall be maintained and kept on the site of the work. The Contractor shall be required to sign such entries in the work-order book in token of having noted the instructions. However, if the Contractor fails to sign the work-order book for any reason whatsoever, the entry of the instructions in the work-order book shall be deemed to be due notice to him of the said instructions. The work-order book shall be open for inspection to the Contractor on the site of the work during office hours.

- (2) The Contractor will be entitled to receive the certified copy of the accepted tender along with the work order free of cost and will also be entitled to receive, on request, two sets of contract and working drawings according to the progress of work, as and when needed, free of cost.
- (3) The several documents forming the contract are essential parts of the contract and a requirement occurring in one is a binding as through occurring in all. They are intended to be mutually explanatory and complementary and to describe and provide for a complete work. Further copies of the contract drawings and working drawings if required by them shall be supplied at a rate of Rs. 2500/- per set of contract drawing for the work and Rs. 500/- per working drawings except where otherwise specified.

In the event of any discrepancy in the several documents forming the contract or in any one document, the following order of precedence should apply.

(a) Dimension and quantities:

- (i) Drawings
- (ii) Schedule B of the Tender form
- (iii) Specifications. On drawings, figured dimensions, unless obviously incorrect, will be followed in preference to scaled dimensions.

(b) Description:

- (i) Schedule – B of the ‘Tender Form’ (ii) Drawings.
- (ii) Specifications. In the case of defective description or ambiguity, the Engineer-in-Charge is entitled to issue further instructions directing in what manner the work is to be carried out. The Contractor cannot take any advantage of any apparent error or omission in drawings or specifications and the Engineer-in-Charge shall be entitled to make corrections and interpretations as necessary to fulfill the plans and specifications.

Clause – 14.1 : The City Engineer (W R M) shall have power to make any alterations in or addition to the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the Contractor shall be bound to carry out the work in accordance with any instructions in this connection which may be given to him in writing signed by the City Engineer (W R M) and such alteration shall not invalidate the contract and additional work which the Contractor may be directed to do in the manner above specified as part of the work shall be carried out by the Contractor on the same conditions in all respect on which he agreed to do the main work and at the as are specified in the tender for the main work

Clause – 14.2 :Deleted

Clause – 14.3 :Deleted

Clause – 14.4: If the additional or alternation work includes any class of work for which no rate is specified in this contract when such class of work shall be carried out at the rate entered in the Schedule of Rates of the Department or, at the rates mutually agreed upon between the City Engineer (W R M) and Contractor, whichever are lower. If the additional or altered work, for which no rate is entered in the Schedule of Rates of Department is ordered to be carried out before the rates are agreed upon, then the contractor shall within seven days of the date of receipt by him of the order to carry out the work, inform the City Engineer (WRM) of the rate, he shall by notice in writing, be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner as he may consider advisable, provided always that if the contractor shall commence work or incur any expenditure in regard thereto before the rates shall have been determined as lastly herein before mentioned, then in such case, he shall only be entitled to be paid in respect of the work carried out or expenditure incurred by him prior to the date of the determination of the rate as aforesaid according to such rate or rate as shall be fixed by the City Engineer (W R M). In the event of a dispute, the decision of the Concerned Dy. Municipal Commissioner of the Municipal Corporation shall be final.

Where, however, the work is to be executed according to the designs, drawings and specifications recommended by the Contractor and accepted by the competent authority, the alterations above referred to shall be within the scope of such designs and specifications appended to the tenders.

The time limit for the completion of the work shall be extended in the proportion that the increase in the cost occasioned by alteration bears to the cost of the original contract work, and the certificate of the Engineer-in-charges as to such proportion shall be final and conclusive.

Clause – 14.5: Deleted

Clause -15 : No claim to any payment or compensation or for restriction of work : If any time after the execution of the contract documents the Engineer-in-charge shall for any reason whatsoever, require the whole or part of the work, as specified in the tender, be stopped for any period or shall not require the whole or part of the work to be carried out at all or to be carried out by the Contractor, he shall give notice in writing, stating the fact to the Contractor who shall thereupon suspend or stop the work totally or partially, as the case may be. In any such case, except as provided hereunder, the Contractor shall have no claim to any payment or compensation whatsoever except as provided hereunder on account of any profit or advantage which he might have derived from the execution of the work in full but which he did not so derive in consequence of the full amount of the work not having been carried out, or on account of any loss that he may be put to on account of materials purchased or agreed to be purchased or for unemployment of labour required by him. He shall not have also any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions which may involve any containment of the work as originally contemplated.

A Clause – 15A : The Contractor shall not be entitled to claim any compensation from Municipal Corporation on account of delay by Municipal Corporation in the supply of materials entered in Schedule “A” where such delay is caused by the (i) Non-supply due to short allotment of quota in case materials available under quota regulations (ii) Difficulties relating to the supply of railway wagons (iii) Force majeure (iv) Act of God (v) Act of the country’s enemies or any other reasonable cause beyond the control of Corporation.

In the case of such delay in the supply of materials, Municipal Corporation shall grant such extension of time for the completion of the works as shall appear to the Engineer-in-Charge to be reasonable to accordance with the circumstances of the case. The decision of the Engineer-in-Charge as the extension of time shall be accepted as final by the Contractors. (As modified Vide R & B D.G.R. No. TNC – 1096 – IB – 143 – (16) – C dated 11 – 1 99)

Clause – 16: Time-Limit for unforeseen claims: The Contractor shall not be entitled to any compensation from Municipal Corporation on any account unless where allowed by the conditions of this contract. In such case, the Contractor shall have to submit a claim in writing to the Engineer-in-charge within one month of the cause of such claim occurring.

Clause – 17 : Action and compensation in case of bad work : If, at any time before the expiry of defects Liability period, as detailed in Clause 17-A, it shall

appear to the Engineer-in-charge or his sub-ordinate in charge of the work, that any work has been executed with unsound, imperfect or unskilled workmanship or with materials or inferior quality or that any materials or articles provided by him for the execution of the work are unsound, or of a quality inferior to that contracted for or are otherwise not in accordance with the contract, it shall be lawful for the Engineer-in-Charge to intimate this fact in writing to the Contractor and then notwithstanding the fact that the work, materials or articles complained of, may have been passed, certified and paid for, the Contractor shall be bound forthwith to rectify, or remove and reconstruct the work so specified in whole or in part as the case may require, or if so required shall remove the materials or articles so specified in whole or in part and provide other proper and suitable materials or articles at his own charge and cost, and in the event of his failing to do so within a period to be specified by the Engineer-in-charge in the written intimation aforesaid, the Contractor shall be liable to pay compensation at the rate of one percent on the amount of the estimate of the rectification for every day not exceeding ten days during which the failure so continues, and in the event of any such failure as aforesaid continuing beyond ten days, the Engineer-in-charge may rectify or remove, and re-execute the work or remove and replace the materials complained of, as the case may be at the risk and expense in all respects of the Contractor should the Engineer-in-charge consider that any such inferior work of materials as described above may be accepted or made use of, it shall be within his discretion to accept the same at such reduced rates as he may fix therefore,

However, the contractor shall be responsible for normal maintenance of the work till the final bill for the work is prepared by the corporation officer.

A Clause – 17A: Defect Liability Period : The Contractor shall be responsible to make good and remedy at his own expense any defect which may develop or may be noticed before the period mentioned hereunder from the certified date of completion. The Engineer-in-charge shall give the Contractor a notice in writing about the defects and the Contractor shall make good the same within 15 days of receipt of the notice. In the case of failure on the part of the Contractor, the Engineer-in-charge may rectify or remove or re-execute the work at the risk & cost of the Contractor. The Engineer-in-charge shall be entitled to appropriate the whole or any part of the amount of the security deposit towards the expenses, if any, incurred by him in rectification, removal or re-execution. The Defects Liability period shall be as under:-

- (a) for all works costing up to Rs. 50,000/- (amount put to tender) the period shall be 3 months from the certified date of completion.
- (b) for all works more than Rs. 50,000 and up to Rs. 1 crore (amount put to tender) the period shall be 12 months from the certified date of completion or one monsoon, whichever is later.
- (c) for major projects costing more than Rs. 1 Crore, the period shall be 18 months from the certified date of completion which should include one monsoon. For the purpose of deciding the monsoon period the 30th September may be treated as the last date.
- (d) for buildings works, the period specified in (a), (b) or (c) above OR elapse of monsoon period following the certified date of completion, whichever is later.

For the purpose of deciding the monsoon period, the 30th September may be treated as the last date.

B Clause – 17 B : Maintenance and repairs of the road during guaranteed period : The contractor shall maintain and keep on proper condition and repair, at his cost the surface of the road for 1 year from the date from which the final finishing coat is laid to the satisfaction of the Concerned Dy. Municipal Commissioner. The decision of the Concerned Dy. Municipal Commissioner as to the necessity of repairs to the surface of the road shall be final and binding on the contractor. If the contractor fails to maintain and keep in proper condition and repair the surface of the road during the stipulated period of 1 year, the Concerned Dy. Municipal Commissioner shall be entitled to carry out the necessary repairs departmentally at the cost of the contractor. The decision of the Concerned Dy. Municipal Commissioner as to amount of the expenses incurred in carrying out the repairs shall be final and binding on the contractor. The Concerned Dy. Municipal Commissioner shall be entitled to appropriate the whole or any part of the amount of the security deposit towards the expenses, if any, incurred by him in repairing the surface.

(This will apply to a contract where the works are to be executed by the contractor according to the specifications).

Clause – 18 : Work to be open to inspection Contractor or responsible agent to be present : All works under or in course of execution or executed in pursuance of the contract shall at all times, be open to the inspection and supervision of the Engineer-in-charge and his subordinate and the Contractor shall, at all times during the usual working hours, and at all other times at which reasonable notice of the intimation of the Engineer-in-charge or his subordinate to visit the works shall have been given to the Contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing present for that purpose. Orders given to the Contractor's duly authorized agent shall be considered to have the same force and effect as if they had been given to the Contractor himself.

Clause – 18 (a) : Employment of a qualified Site Engineer by the Contractor : (Vide G.R.B& CD No. RGN-6090-UO 24 (42)-C, Dated 26-11-90). The Contractor shall employ full-time technically qualified staff during the execution of work as per requirement and as directed by Engineer in charge.

The Engineer so employed for the Municipal Corporation work must have sufficient experience to handle the work independently. Such an Engineer shall have to stay at the site of work and he shall not be entrusted with any other duty except of this work.

In case the contractor or a partner of the contractor Firm is a Civil graduate engineer, employment of a separate Engineer will not be necessary provided that the Engineer partner himself attends the execution of the work on site.

Clause – 19 : Notice to be given before work is covered up : The Contractor shall give not less than five days' notice in writing to the Engineer-in-charge or

his subordinate in charge of the work before covering up or otherwise placing beyond the reach of measurement any work, in order that the same may be measured and correct dimensions thereof taken before the same is so covered up or placed beyond the reach of measurement and shall not cover up or place beyond the reach of measurement any work without the consent in writing of the Engineer-in-charge or his subordinate in charge of the work and if any work shall be covered up or placed beyond the reach of measurement without such notice having been given or consent obtained, the same shall be uncovered at the Contractor's expense and in default thereof, no payment or allowance shall be made for such work or for the materials with which the same was executed.

Clause – 20 : If the Contractor or his workmen, or servants shall break, deface injure or destroy any part of the building or work in question or work in question in/on which they may be working or any building, road, fence, enclosure or grass-land or cultivated ground contiguous to the premises on which the work or any part thereof is being executed or if any damage shall be done to the work from any cause whatever before completion of the work or before the completion of the maintenance period whichever is later or any damage occurred / caused due to normal flood or rain or if any imperfections become apparent in it within three months from the grant of a certificate of completion, final or otherwise by the Engineer-in-charge the Contractor shall make good the same at own expenses or in default, the Engineer-in-charge may cause the same to be made good by other contractor and deduct the expenses (of which the certificate of the Engineer-in-charge shall be final) from any sums that may thereafter become due to the contractor or from his security deposit or the proceeds of sale thereof or a sufficient portion thereof.

A Clause – 20A : Force Majeure : Neither party shall be to liable to the other for any loss or damage occasioned by or arising out of acts of god, and in particular, unprecedented Floods, volcanic eruption, earth quake or other convulsion of nature, and other acts such as but not restricted to general strike, invasion, the act of foreign countries, hostilities or war like operations before or after declaration of war, rebellion, military or usurped power which prevent performance of the contract and which could not have been for seen or avoided by a prudent person.

NOTE :“Unprecedented flood” means the flood crossing the high flood level of the past 50 years which is on the available record. (Modified Vide R & B D.G.R. No. TNC – 1096 – IB –143 – (16) – C dated 11-1-99.

Clause – 21 : Contractor to supply plant, ladders, scaffolding etc., and is liable for damage arising from non-provision of lights, fencing etc., : The Contractor shall supply at his own cost all materials (except such special materials if any, as may, in accordance with the contract of be supplied from the Public Works Corporation Stores), plant, tools, appliances, implements, ladders, cordage, tackle, scaffolding and any temporary works which may be required for the proper execution of the work whether in the original, altered or substituted from and whether included in the specifications, or other documents forming part of the contract or referred to in these conditions or not and which may be necessary for the purpose of satisfying or complying with requirements of the Engineer-in- charge as to any matter or to which under these conditions he is entitled to be

satisfied or which he is entitled to require together with carriage there for to and from the work. The Contractor shall also supply without charge the requisite number of persons with the means and material necessary for the purpose of setting out works and counting, weighing and assisting in the measurement or examination at any time and from time to time, of the work or the materials. Failing this, the same may be provided by the Engineer-in-Charge at the expense of the Contractor and the expenses may be deducted from any money due to the Contractor under the contract or from his security deposit, or proceeds of sale thereof, or of a sufficient portion thereof. The contractor shall provide all necessary fencing and lights required to protect the public from accident and shall also be bound to bear expenses of defense of every suit, action or other legal proceeding at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such person, or which may, with the consent of the Contractor, be paid in compromising any claim by any such persons.

A Clause – 21A: The contractor shall provide suitable scaffolds, working platforms, gangways and stairways and shall comply with the following regulations in connection therewith–

- (a) Suitable scaffolds shall be provided for workmen for all work that cannot be safely done from a ladder or by other means.
- (b)(i) Under the supervision of a competent and responsible person,
- (b)(ii) Appointed by Contractor and by competent workers possessing adequate experience in this kind of work.
- (c) All scaffolds and appliances connected therewith and all ladders shall–
 - (i) Be of sound material.
 - (ii) Be of adequate strength having regard to the loads and strains to which they will be subjected and
 - (iii) Be maintained in proper condition.
- (d) Scaffolds shall be so constructed that no part thereof can be displaced in consequence of normal use.
- (e) Scaffolds shall not be overloaded and so far as practicable the load shall be evenly distributed.
- (f) Before installing the lifting gear on scaffolds, special precaution shall be taken to ensure strength and stability of the scaffolds.
- (g) Scaffolds shall be periodically inspected by a competent person

- (h) Before allowing a scaffold to be used by his workman, the Contractor shall, whether the scaffold has been erected by his workmen or not, take steps to ensure that it complies fully with the regulations herein specified.
- (i) Working platforms, gangways shall–
 - (j) be so constructed that no part thereof can sag unduly or unequally.
 - (ii) be so constructed and maintained having regard to the prevailing conditions as to reduce as far as practicable risks of persons tripping or slipping; and–
 - (iii) be kept free from any unnecessary obstruction.
- (k) In the case of working platforms, gangways working places and stairways at a height exceeding 3.25 meters.
 - (i) Every working platform and every gangway shall be closely boarded unless other adequate measures are taken to ensure safety.
 - (ii) Every working platform and every gangway shall have adequate width, and
 - (iii) Every working platform, gangway, working place and stairway shall be suitably fenced.
- (l) Every opening in the floor of a building or in working platform shall, except for the time and to the extent required to allow the access of person or the transport or shifting of materials be provided with suitable means to prevent the fall of persons or material.
- (m) When persons are employed on a roof where there is danger of falling from a height exceeding 3.25 meters, suitable precaution shall be taken to prevent the fall of persons or material.
- (n) Suitable precautions shall be taken to prevent persons being struck by articles which might fall from scaffolds or other working places.
- (o) Safe means of access shall be provided to all working platforms and other working places.

B Clause – 21B: The Contractor shall comply with the following regulations as regards the Hoisting Appliances to be used by him–

- (a) Hoisting machines and tackle, including their attachments anchorages and supports shall–
 - (i) be of good mechanical construction, sound material and adequate strength and free from patent defect; and
 - (ii) be kept in good repair and in working order
- (b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of suitable quality and adequate strength and free from patent defect.
- (c) Hoisting machines and tackle shall be examined and adequately tested after erection on the site and before use and be re-examined in position at intervals to be prescribed by Engineer-in-Charge.

- (d) Every chain, ring, hock, shackle, swivel and pulley block used in hoisting or lowering materials or as a means of suspension shall be periodically examined.
- (e) Every crane driver or hoisting-appliance-operator shall be properly qualified.
- (f) No person who is below age of 15 years shall be in control of any hoisting machine, including any scaffold, nor shall give signals to the operator.
- (g) In the case of every hoisting machine and of every chain, ring hook, shackle, swivel and pulley block used in hoisting or lowering or as a means of suspension, the safe working load shall be ascertained by adequate means.
- (h) Every hoisting machine and all gears referred to in preceding regulation shall be plainly marked with the safe working load.
- (i) In the case of hoisting machine having a variable safe working load, each safe working load and conditions under which it is applicable shall be clearly indicated.
- (j) No part of any hoisting machine or any gear referred to in regulation 'g' above shall be loaded beyond the safe working load except for the purpose of testing.
- (k) Motors, gears, transmissions, electric wiring and other dangerous parts of hoisting appliance shall be provided with sufficient safeguards.
- (l) Hoisting appliances shall be provided with such means as will reduce to a minimum the risk of the accidental descent of the load.
- (m) Adequate precautions shall be taken to reduce to minimum the risk of any part of a suspended load becoming accidentally displaced.

Clause – 22: Measures for Prevention of Fire: The Contractor shall not set fire to any standing jungle, trees, bush wood or grass without a written permit from the Engineer-in-charge.

When such permit is given, and also in all cases when destroying cut or dug up tress, bush wood, grass etc., by fire, the Contractor shall take necessary measures to prevent such fire spreading to or other-wise damaging surrounding property.

Clause – 23 : Liability of Contractors for any damages done in or outside work area : Compensation for all damage done intentionally or unintentionally by contractors labourers whether in or beyond limits of Municipal Corporation property including any damage caused by the spreading of fire mentioned in the clause 22, shall be estimated by the Engineer-in-charge, or such other officer as he may appoint, and the estimates of the Engineer in charge, subject to the decision of the Concerned Dy. Municipal Commissioner, on appeal, shall be final and the Contractor shall be bound to pay the amount of the assessed compensate on

demand, failing which the same will be recovered from the Contractor as damages in the manner prescribed in clause 1 or deducted by the Engineer-in-Charge from any sums that may be due or become due from Municipal Corporation to the Contractor under this contract or otherwise.

The contractor shall bear the expenses of defending any action or other legal proceeding that may be brought by any person for injury sustained by him owing to neglect of precautions to prevent the spread of the fire and he shall also pay the damages and cost that may be awarded by the court in consequences.

Clause – 24: Deleted.

Clause – 25: Deleted.

Clause – 26: Work not to be sublet. Contract may be rescinded and security deposit forfeited for subletting it without approval or for bribing a public officer or if contractor becomes insolvent: The contract shall not be assigned or sublet without the written approval of the Engineer-in-charge. And if the contractor shall assign or sublet his contract or attempt to do so or become insolvent or commence any proceeding to get himself be adjudicated an insolvent or make any compromise with his creditors, or attempt to do so, the Engineer- in-charge may, by notice in writing rescind the contract. Also if any bribe, gratuity, gift, loan, perquisite, reward or advantage, pecuniary or otherwise, shall either directly or indirectly be given, promised or offered by the contractor, or any of his servants or agents to any public officer or person in the employ of Municipal Corporation in any way relating to his office or employment, or if any such officer or person shall become in any way directly or indirectly interested in the contract, the Engineer-in-Charge may thereupon by notice in writing rescind the contract. In the event of contract being rescinded, the security deposit of the Contractor shall thereupon stand forfeited and be absolutely at the disposal of Municipal Corporation and the same consequences shall ensue as if the contract had been rescinded under clause 3 hereof and in addition the Contractor shall not be entitled to recover or be paid for any work thereof actually performed under the contract.

Clause – 27: Sum payable by way of compensation to be considered as reasonable compensation without reference to actual loss : All sums payable by a Contractor by way of compensation under any of these conditions shall be considered as a reasonable compensation to be applied to the use of Municipal Corporation without reference to the actual loss or damage sustained and whether any damage has or had not been sustained.

Clause – 28: Changes in the constitution of firm to be notified: in the case of a tender by partners, any changes in the constitution of a firm shall be forthwith notified by the contractor to Engineer-in-Charge for his information.

Clause – 29: Works to be under directions of Concerned Dy. Municipal Commissioner: All works to be executed under the Contract shall be executed under the direction and subject to the approval in all respects of the Concerned Dy. Municipal Commissioner of the Circle for the time being, who shall be

entitled to direct at what point or points and in what manner they are to be commenced and from time to time carried on.

Clause – 30 (1): Dispute referred to Arbitrator / Tribunal / Court of law:

The disputes relating to this contract, so far as they relate to any of the following matters, whether such disputes arise during the progress of the work or after the completion or abandonment thereof, shall be referred to the sole Arbitration appointed by AMC of the persons who is holding or has held a post not below the rank of Superintending Engineer /City Engineer / Dy. Municipal commissioner (Engineering) as far as possible in the consultation with agency if it is necessary and such dispute shall be settled in accordance with the arbitration and conciliation Act 1996 ,under this Corporation of the State of Gujarat.

- (i) The rates of payment under clause 5 for any tools, materials and stores in or upon the works of the site thereof or belonging to the contractor or procured by him and intended to be use for execution of the work or any part thereof of which possession may have been taken by the Engineer-in-Charge under the saidclause-5.
- (ii) The reduction in rates made by the Engineer-in-Charge, under clause 9 for the items of work not accepted as completed fully in accordance with the sanctioned specifications.
- (iii) The rates of payment for any class of work which is included in the additional or altered work carried out by the Contractor in accordance with the instructions of the Engineer-in-Charge under clause 14 and the rate for which is to be determined under the said clause14.
- (iv) The rates of payment for materials already purchased or agreed to be purchased by the Contractor before receipt of notice given by the Engineer-in-Charge under clause 15, and / or the amount of compensation payable to the Contractor under the said clause for loss in respect of such materials.
- (v) The amount of compensation which the contractor shall be liable to pay under clause 17 in the event of his failure to rectify, remove or reconstruct the work within the period specified in the written intimation or the amount of expenses incurred by the Engineer-in-Charge under the said clause 17 in rectifying, removing, or re-executing the work or in removing and replacing the materials or articles complained of.
- (vi) The reduction of rates as may be fixed by the Engineer-in-Charge under clause 17 for the inferior work or materials as accepted or made use of.
- (vii) The amount of compensation payable by the Contractor for damages as estimated and assessed under clause23.
- (viii) The amount payable to the Contractor for the work carried out under clause 33 in accordance with the instruction and the requirement of the Engineer-in-Charge in a case where there is no specifications.

(2) Deleted

(3) Deleted

(4) Deleted

- (4a) the disputes will be referred to court of law and its jurisdiction will be Ahmedabad.
- (5) In case of dispute leading to the contractor or Municipal Corporation approaching to Court of Law, it shall be within the jurisdiction where the site of work is situated.
- (6) The reference to court proceeding under this clause shall not:
- i) affect the right of the Engineer in charge under clause 5 to take possession of all or any tools, plants, materials and stores in or upon the works of site thereof belonging to the contractor or procured by him and intended to be used for the execution of the work or any part thereof.
 - ii) Preclude the Engineer in charge from utilizing the materials purchased by the contractor in any work or from removing such materials to other places, during the period the work is stopped or suspended in pursuance of notice given to the contractor under clause 15.
 - iii) Entitle the contractor to stop the progress of the work or carrying out the additional or altered work in accordance with the provisions of clause 14 or as the case may be, of clause 33.

Clause – 31: Deleted.

Clause – 32 : Lump sums in estimates : When the estimate on which a tender is made includes lump sum in respect of part of the work, the contractor shall be entitled to payment in respect of the items of work involved or the part of the work in question at the same rates as are payable under this contract for such items or if the part of the work in question is not in the opinion of the Engineer-in-charge capable of measurement, the Engineer-in-Charge may, as his discretion, pay the lump sum amount entered in the estimate and the certificate in writing of the Engineer-in-charge shall be final and conclusive against the Contractor with regard to any sum or sums payable to him, under the provisions of this clause.

A Clause – 32 A: Access to the Site: The Contractor shall arrange to construct, maintain and afterwards remove and reinstate any temporary access required for and in connection with the execution of the works. Reinstatement shall include restoring the area of the access route to at least the degree of safety, stability, Water and appearance that existed before the Contractor entered the site.

Clause – 33: Action where no specifications: In case of any class of work for which there is no such specification, such work shall be carried out in accordance with the IS specifications, and in the event of there being no IS Specifications, then, in such case the work shall be carried out in all respects in accordance with the instructions and requirements of the Engineer-in-Charge.

Clause – 34: Definition of work : The expression “work” or “works” where used in these conditions shall, unless, there be something in the subject or context repugnant to such construction, be construed to mean the work, or the works, contracted to be executed under or in virtue of the contract, whether temporary or permanent and whether original, altered, substituted or additional.

Clause – 35 : Contractor’s percentage whether applied to net or gross amount of the bill: Percentage referred to in the tender shall be deducted from / added to the gross amount of the bill before deducting the value of any stock issued. (This clause shall be Applicable only for B-1 tender)–

Clause – 36: Non-refund of quarry fees and Royalties: The contractor shall pay the royalty to the competent authority/local body as per rules. The contractor shall furnish quarterly the statement showing quantity of quarried materials from whom purchased (with full address of the seller) and copies of bill for purchase to the district officer of the Geology and Mining Corporation or authority competent to levy royalty in the area of work. Copy of such statement shall be furnished to the Engineer in charge also. Contractor shall also furnish such additional information as regards royalty payment of the Engineer in charge and the Royalty authority. The royalty charges paid shall be borne by the Contractor and shall not be reimbursed by the Ahmedabad Municipal Corporation (Authority: - R & BD. Circular No. TNC-2286-UO-39 (19)-C dated 23-10-1989.)

Clause – 37: Compensation under the Workmen’s Compensation Act: The Contractor shall be responsible for and shall pay any compensation to his workman payable under the Workmen’s Compensation Act, 1923 (VIII of 1923) (hereinafter called the said ACT) for injuries caused to the workmen. If such compensation is paid by Municipal Corporation as principal under sub-section 12

(1) of the said Act, on behalf of the Contractor, it shall be recoverable by the Municipal Corporation from the Contractor under sub-section 12 (2) of the said section. Such compensation shall be recovered in the manner laid down in clause 1 above.

B.2.37A Clause – 37-A: The Contractor shall be responsible for and shall pay the expenses of providing medical aid to any workmen who may suffer a bodily injury as a result of an accident. If such expenses are incurred by Municipal Corporation, the same shall be recoverable from the Contractor forthwith and be deducted, without prejudice to any other remedy of Municipal Corporation, from any amount due or that may become due to the Contractor.

B Clause – 37-B: The Contractor shall provide all necessary personal safety equipment and first-aid apparatus available for the use of the persons employed on the site and shall maintain the same in suitable condition for immediate use at any time and shall comply with the following regulations in connection therewith:

- (a) The workers shall be required to use the equipment so provided by the Contractor and the Contractor shall take adequate steps to ensure proper use of the equipment by those concerned.
- (b) When work is carried out in proximity to any place where there is a risk of drowning all necessary equipments shall be provided and kept for use and all necessary steps shall be taken for the prompt rescue of any person in danger.

- (c) Adequate provision shall be made for prompt first-aid treatment of all injuries likely to be sustained during the course of the work.

Clause – 38: The Quantities shown in the tender are approximate and no claim shall be entertained for qualities of work executed being less than those entered in the tender. In the case of increase in the quantities by more than 30 %, the new rate will be paid to the Contractor for the quantities in excess of 30%. The rates for the increased quantities as aforesaid will be fixed in the manner specified in clause –14.

Clause – 39: Employment of famine or other labour: The Contractor shall employ any famine, convict or other labour of particular kind or class, if ordered in writing to do so by the Engineer-in-charge.

Clause – 40: No compensation shall be allowed for any delay caused in the starting of the work on account of delay in making available the full site of land at a time.

Clause – 41: Claim for compensation for delay in the execution of work :No compensation shall be allowed for any delay in execution of the work on account of water standing in borrow-pits or compartments. The rates are inclusive of hard or cracked soil, excavation in mud, sub-soil water or water standing in borrow-pits and no claim for an extra rate shall be entertained unless otherwise expressly specified.

Clause – 42: Entering upon or commencing any portion or work: The contractor shall not enter upon or commence any portion of work except with the written authority and instructions of the Engineer-in-charge or of his subordinate in charge of the work. Failing such authority, the contractor shall have no claim to ask for measurements of or payment for work.

Clause – 43: Minimum age of person employed: (i) No contractor shall employ any person who is under the age of 14years.

A Clause – 43(I) (A): The employment of donkeys and/or other animals and the payment of fair wages:

- (i) For asphalt work(s), as far as possible only the adult persons should be employed on Corporation OR the contracted work as the case may be. If the adult persons are not available, then the children below the age of 15 (Fifteen years) should not be employed under any circumstances.
- (ii) No contractor shall employ donkeys or other animals with breeching of string or thin rope. The breeching must be at least three inches wide and should be of tape (Nawar).
- (iii) No animal suffering from sores, lameness or emaciation or which is immature shall be employed on the work.
- (iv) The Engineer-in-Charge or his agent is authorized to remove from the work any person or animal found working which does not satisfy these

Conditions and no responsibility shall be accepted by Municipal Corporation for any delay caused in the completion work by such removal.

- (v) The Contractor shall pay fair and reasonable wages to the workmen employed by him in the contract undertaken by him. In the event of any dispute arising between the contractor and his workmen on the grounds that the wages paid are not fair and reasonable, the dispute shall be referred without delay to the Engineer – in – charge who shall decide the same. The decision of the Engineer – in – charge shall be conclusive and binding on the Contractor, but such decision shall not in any way affect the conditions in the contract regarding the payment to be made by Municipal Corporation at the sanctioned tender rates.
- (vi) The Contractor shall provide drinking water facilities to the workers / labourers employed on Municipal Corporation works. Amenities relating to sanitation shall also be provided to the workers / labourers employed on works (in urban areas). If the contractor fails to comply with these provisions, the Engineer - in - charge shall give notice in writing and if the contractor does not provide this facility to the workers /labourers within a period of ten days from the date of the notice in writing, the Engineer in charge shall there upon make the arrangement for drinking water at the cost of the Contractor.
- (vii) The Contractor shall provide the amenity of proper shade and shelter to the workers / labourers and their children on Municipal Corporation works as soon as the work starts. If the Contractor fails to provide shed and shelter, the Engineer-in – charge shall provide the same at the cost of Contractor.

Clause – 44: Method of payment : Payment to Contractor shall be made by cheque drawn on any treasury, accounts department of corporation, provided the amount exceeds Rs. 10. Amount not exceeding Rs. 10 will be paid in cash.

A Clause – 44-A:Any sum of money due and payable to the Contractor (including the security deposit returnable to the Contractor) executing any Municipal Corporation work under this contract shall be appropriated by Municipal Corporation and shall be set off against any claim of the Municipal Corporation for the payment of a sum of money arising out or under any other contract made by the Contractor with the Municipal Corporation. When no such amount for purpose of the recovery from the Contractor against any claim of the Municipal Corporation is available, such a recovery shall be made from the Contractor as arrears of land revenue.

Clause – 45: Deleted

Clause – 46 : Employment of scarcity labour : If Municipal Corporation declares a state of scarcity or famine to exist in any village situated within 16 kilometers of the work, the Contractor shall employ upon such parts of the work, as are suitable for unskilled labour, any person certified to him by the Engineer in charge or by any persons to whom, the Engineer in charge may have delegated this duty in writing to be in need of relief and shall be bound to pay to such persons, wages not below the minimum which Municipal Corporation may have fixed in this behalf. Any disputes which may arise in connection with the

Implementation of this clause shall be decided by the Engineer in charge whose decision shall be final and binding on the Contractor.

Clause – 47 -Deleted

Clause – 48: Rate Exclusive of GST and all other taxes

The rates to be quoted by the Contractor must be **Exclusive of GST** but inclusive of all other taxes. However any subsequent changes in the tax structure by Government after due date of bid submission will be compensated on availability of submission of actual documentation. Contractor has to intimate Engineer in charge regarding changes occurred in the tax structure after bid submission. If contractor fails to provide such information and if any financial obligation may arise due to change in tax structure, same will be recovered from the contractor. The Contractor shall apply fair means of stock maintenance and shall adopt accounting standards as may be prescribed under of GST. For arriving at the difference in procurement prices due to introduction of GST, it will be open for the Government to ask for original invoice, L.R, weigh bridge slips; payment details and such other document as may be required for the purpose. If there is reduction in overall tax burden then proportional benefit of that shall be passed on the Government.

NOTE: The rates to be quoted by the Contractor must be exclusive of GST but inclusive of all other taxes. GST shall be paid extra on the admissible payment as per the approved tender rates and condition of price variation; GST should be paid as per prevailing rates at the time of payment.

Clause – 49 :The Contractor should as far as possible, obtain his requirement of labourers, skilled and unskilled, from the nearest Employment Exchange so as to utilize the local employment potential. If there are no local Employment Exchanges or such Exchanges are not able to provide the required labourers locally. Suitable labourers should be utilized to the maximum extent possible.

Clause – 50 : Fair Wages : If the Contractor fails to pay within 7 (Seven) days to the labourer(s) / worker (s) the minimum wages prescribed by the Corporation under the minimum wages Act, 1948 as in force from time to time, the Engineer in charge shall be at liberty to deduct the amount payable to the labourer(s) worker(s) from his (Contractor's) bills or deposit(s) payable by the Contractor after making due inquiries and establishing the claim(S) of the labourers(s) worker(s).

The Contractor shall not be entitled to any payment or compensation on account of any loss that the Contractor may have to incur on account of the action as aforesaid. Before the action as aforesaid, is enforced, a notice in writing to the Contractor shall be issued by the Engineer-in-charge to pay the wages as per Minimum Wages Act in force at the relevant time. If contractor does not act as aforesaid within seven days, then the action contemplated as above shall be taken against him.

Clause – 51: Deleted

Clause – 52: List of Machinery: The Contractor shall also give a list of machineries in his possession and which he propose to use on the work.

Clause – 53 :(i) In case, the roller deployed by Corporation for the use on contract work is kept idle by the Contractor for want of adequate labour and materials, the

Contractor will have to pay rental charges as per prevailing rules even through the items of rolling and watering are to be carried out by the Corporation.

- (ii) If the Contractor does not plan his programme so as to suit the requirement of the Municipal Corporation, the proportionate rental charges on roller shall have to be recovered from the Contractor.

Clause – 54: Local labour on normal rates : The Contractor shall have to engage local labour and person seeking employment where available on normal rate.

Clause – 55: Deleted

Clause – 56: The Contractor shall employ only such labour who shall produce a valid certificate of having been vaccinated against small pox within a period of last three years.

~~**Clause – 57 : (1) Huts :** The Contractor shall build a sufficient number of huts on a suitable plot of land for the use of the labourers according to the following specifications:~~

- ~~(i) Huts of bamboos and grass may be constructed.~~
- ~~(ii) A good site shall be selected, high ground removed from jungle but well provided with trees shall be chosen wherever it is available. The neighborhood of rank jungle, grass or weeds should particularly be avoided; camps should not be established close to large cuttings of earth work.~~
- ~~(iii) The lines of huts shall have open spaces of at least 10 m. between rows; When a good natural site cannot be procured, particular attention should be given to the Water.~~
- ~~(iv) There should be no overcrowding, Floor spaces at the rate of 2.8 sq.m. per head shall be provided. Care should be taken to see that the huts are kept clean and in good order.~~

~~**(2) Drinking Water:**~~

~~The Contractor shall, as far as possible, provide an adequate supply of chlorinated pure potable drinking water for the use of labourers. This provision shall be at the rate of not less than 45 liters per head, no provision need be made where there is a suitable nalla, river or well within 0.4 km. of the camp. However arrangement should, as far as possible, be made to chlorinate water by chlorine tablets before it is allowed for drinking purpose.~~

~~**(3) The Contractor shall construct semi permanent latrines for the use of labourers on the following scale, namely:**~~

- ~~a) Where females are employed, there shall be least one latrine for every 25 females.~~
- ~~b) Where males are employed, there shall be at lease one latrine for every 25 males.~~

~~Provided that where the number of males or females exceed 100, it shall be sufficient if there is one latrine for every 25 males or females, at the case may be, up to the first 100 and one for every 50 thereafter.~~

~~(4) Privacy in latrines:~~

~~Every latrine shall be under cover and so partitioned off as secure privacy, and shall have a proper door and fastenings.~~

~~(5) Notice to be displayed outside latrines and urinals:~~

- ~~(1) — Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal a notice in the language understood by the majority of the workers “For Men only” or “For Women only”: as the case may be.~~
- ~~(2) — The notice shall also bear the figures of a man or of a woman, as the case may be.~~

~~(6) Urinals:~~

~~There shall be at least one urinal for male workers up to 50 and the for female workers up to 50 employed at a time. Provided that there where the number of male or female workmen, as the case may be exceeds 500, it shall be sufficient if there is one urinal for every 50 males or females up to the first 500 and one for every 100 males or females or part thereof.~~

~~(7) Latrines and Urinals to be accessible:~~

~~(1) The latrines and urinals shall be conveniently situated and accessible to workers at all times at the establishment. (2) (i) The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all time (2) (ii) Latrines and urinals other than those connected with a flush sewage system shall comply with the requirements of the Public Health Authorities.~~

~~(8) Water for latrines and urinals:~~

~~Water shall be provided by means of tap or otherwise, so also be conveniently accessible in or near the latrines and urinals.~~

~~(9) Bathing and washing places:~~

- ~~1. — The Contractor shall construct a sufficient number of bathing places, every unit of 20 persons being provided with a separate bathing place.~~
- ~~2. — Washing places should also be provided for the purpose of washing clothes. Every unit of 30 persons shall have at least one washing place.~~
- ~~3. — Such bathing and washing places should be suitably screened and separate places provided for male and female workers.~~
- ~~4. — Such facilities shall be conveniently accessible and shall be kept in clean and hygienic.~~

~~(10) Water:~~

~~The Contractor shall make sufficient arrangements for draining away the sewerage water as well as water from the bathing and washing places and shall dispose of this waste in such a way as not to cause nuisance. The Contractor~~

~~should obtain a permission form the Gujarat Water Pollution Control Board, Gandhinagar, if water is to be drained in river or near the well. The Contractor would put material oil once in a week in stagnant water round about the residence.~~

~~(11) Medical facilities:~~

~~The Contractor shall engage a medical officer with a travelling dispensary for a camp having 500 or more persons if there is no Municipal Corporation or other private dispensary situated with 6 Km. form the camp.~~

~~(12) Conservancy and cleanliness:~~

~~The Contractor shall provide the necessary staff for effecting the satisfactory conservancy and cleanliness of the camp to the satisfaction of the Engineer in charge. Atleast one sweeper per 200 persons should be engaged. Conservancy staff should dump refuse in compost pit, away from the labour camp.~~

~~(13) Health Provisions:~~

~~The Health Officer of the Municipal Corporation of Health Services shall be consulted before opening a labour camp and his instructions on matters, such as, the water supply, sanitary convenience, the camp site, accommodation and food supply shall be followed by the Contractor.~~

~~(14) Precautions against epidemic:~~

- ~~(a) The authorities in charge of the colonies should get the labourers inoculated against cholera and plague and vaccinated against smallpox at the time of recruitment, if they are not inoculated or vaccinated within 6 months or 3 years respectively, prior to the date of recruitment.~~
- ~~(b) When, in any labour camp, there is a outbreak of an epidemic disease or is threatened with such an outbreak, the authorities in charge of the labour camps, should ensure that all the inmates of the labour colonies are inoculated or vaccinated, at the case may be, depending on the diseases, with 72 hours after the outbreak.~~
- ~~(c) The authorities in charge of the labour colony should arrange to communicate by wire regarding the outbreak of the epidemic diseases on the very day of the outbreak, to the Health Officer of Municipal Corporation in charge of that area. Thereafter they should continue to send daily reports to the above officers in the prescribed form regarding the progress of the epidemic disease.~~
- ~~(d) When the authorities in charge of the labour colony suspect or have reason to believe that any in-mate of the labour colony it suffering form the infections or contagious disease, they shall forthwith arrange for the segregation of such persons to isolated huts to be specifically provided for the purpose and also for their treatment.~~
- ~~(e) As regional malaria epidemic outbreaks are likely to occur in such project~~

~~areas, the authorities in charge of the labour colonies should report promptly the occurrence of unusual incidence of cases of malaria and also inform the Health officers of the Municipal Corporation and also arrange to institute all necessary anti malarial measures as may be advised by the officials of the Public Health Corporation.~~

- ~~(f) The authorities in charge of the colonies should also arrange to carry out any other measures that may be recommended by the officials of the Public Health Corporation necessary to prevent or control the spread of disease.~~

~~Clause 58: Contractor shall have to arrange for the supply of gumboots, hand gloves, mask etc., invariably to the labourers/workers engaged by the Contractor on asphalt work.~~

~~Clause 59: The Contractor shall not show any distinction between Harijan and other class of labourers/ workers employed to carry out the Municipal Corporation work.~~

Clause – 60: Price Variation clause: Deleted

~~Clause 61: Fencing and Lighting:~~

- ~~(a) The Contractor shall, unless otherwise specified, be responsible for the proper fencing, lighting, grading and taking of the necessary safety measures for all works comprised in the contract and for the proper provision of temporary road, way, foot ways, guards, fences, caution notices etc., as the same may be rendered necessary by reasons of the work for the accommodation of workmen, foot passengers or other traffic and of owners and occupiers of adjacent property and the public and shall remain responsible for any Accidents that may occur on account of his failure to take proper & timely precautions.~~
- ~~(b) All the arrangements made for fencing and lighting shall be maintained by the Contractor throughout the currency of the contract till the physical taking over of the work by Municipal Corporation.~~

Clause – 62 : Liability of accidents to persons : Responsibilities and liabilities of the contractor under Workmen's Compensation Act.

- (a) On the occurrence of an accident, which results in death of workmen employed by the contractor or which is so serious as is likely to result in death of any such workmen, the Contractor, shall within 24 hours of happening of such accident(s) intimate, in writing, to the Engineer in charge the fact of such accident(s). The contractor shall indemnify Municipal Corporation against all loss or damage sustained by the Municipal Corporation resulting directly from his failure to give intimation in the manner aforesaid including the penalties or fines, if any, payable by the Municipal Corporation as consequence of Municipal Corporation's failure to give notice under the Workmen's Compensation Act or

otherwise to conform to the provisions of the said Act in regard to such accidents(s).

- (b) In the case of an accident, in respect of which compensation may become payable under Workmen's Compensation Act, whether by the Contractor or by the Municipal Corporation as principal Employer, it shall be lawful for the Engineer-in-charge to retain out of money due and payable to the Contractor, such sum or sum of money as may, in the opinion of the Engineer in charge, be sufficient to meet such a liability. The opinion of the Engineer in charge shall be final in regard to all matters arising under this clause.

Clause – 63 : Access to site and work on site : The Engineer may, if he considers fit from time to time, enter upon any land(s), which may be in possession of the Contractor this contract for the purpose of executing any work not included in this contract and may execute such work not included in this contract by agent or by other Contractors, at his opinion and the Contractor shall, in accordance with the requirements of the Engineer-in-charge, afford all reasonable facilities for execution of the work including occupation of lands by structure or otherwise for any other contractor employed by the Municipal Corporation and his workmen or for the workmen of the Municipal Corporation who may be employed in the execution on or near the site of the work not included in the contract or of any contract in connection with or ancillary to the work and in default, the Contractor shall be liable to the Municipal Corporation for any delay or expense incurred by reason of such default. Provided always that if the exercise of these powers shall cause any damage to the contract, he may, within fifteen days of such damage arising, make a statement of the same to the Engineer in charge who shall, from time to time, assess the value in his judgment of such damage and the Municipal Corporation shall from time to time pay to the Contractor the amounts (if any) accepted as justified by the Engineer in charge.

Clause – 64 : Reports regarding labour : The contractor shall submit the following reports to the Engineer in charge.

- (a) (i) A daily report in the form as may be prescribed of the strength of labour both skilled and unskilled employed by him on the work(s). The contractor shall increase or decrease the strength, both skilled or unskilled, if directed by the Engineer in charge. The submission of such report shall not, however, relieve the contractor of his responsibilities and duties regarding progress or any other obligations under the contract.
- (ii) A classified weekly return in the prescribed form of the number of persons employed on the works during the preceding week.
- (iii) A weekly medical report in the prescribed form showing the health of the Contractor's camp, the number of persons ill or incapacitated and the nature of their illness.
- (iv) A report of any accident, which may have occurred, to be sent within 24 hours of the occurrence.
- (v) Such other reports as may be prescribed.

~~Clause – 65 : Treasure trove : In the event of discovery by the Contractor or his employees, during the progress of work of any gold, silver, oil or other minerals of any description and precious stones, treasures, coins, antiquities, relic fossils or other articles or value of interest whether geological, archaeological or any other such treasure & other things shall be deemed to be absolute property of the Municipal Corporation and the Contractor shall duly preserve the same to the satisfaction the Engineer in charge, from time to time, and deliver the same to such persons as the Engineer in charge may appoint.~~

~~The Contractor shall take all reasonable precautions to prevent his workmen or any other person from removing or damaging any such articles or things, immediately after the discovery thereof and before removal acquaint Engineer in charge with such discovery and carry out his orders for the disposal of the same.~~

~~Clause – 66: Indemnity : The Contractor shall identify the Municipal Corporation against all actions, suits claims & demands through or made against the Municipal Corporation in respect of work of this contract and against any loss or damage to Corporation in consequence of any action or suit being brought against the contractor for anything done or omitted to be done in execution of the work of this contract.~~

Clause – 67 : Insurance of labourers : The Contractor shall be responsible to arrange for insurance of all labourers. Skilled and unskilled, workers, supervisors etc., employed by him as per labour regulations of the state.

Clause – 68 : Setting out : The Contractor shall be responsible for the true and proper setting out of the works and the correctness of positions, levels, dimensions and alignments of all parts of the work and for the provisions of all necessary instruments, appliance and labour in connection therewith. If, at any time, during the progress of the work, any errors, appear or arise in the positions, levels, dimensions or alignments of any part of the work, the Contractor, on being required to rectify such errors by the Engineer in charge shall at his own expense do so to the satisfaction of the Engineer in charge, if however, such error is based on incorrect data supplied in writing by the Engineer in charge, the expense of rectifying the same shall be borne by the Corporation. The checking of and setting out of any line or level by the Engineer in charge or his representative shall not in any way, relieve the contractor of his responsibilities for the correctness of the error. The Contractor shall carefully protect and observe all bench marks, site nails, pags and other thins used in setting out of the work(s).

Clause – 69: cement register : A register in the prescribed form showing day to day receipt, consumption and balance of cement on site of work will be maintained by the Municipal Corporation, which shall invariably be signed daily by the Contractor or his authorized representative in token of its correctness.

Clause – 70: Materials and works test register : A register in the prescribed Performa showing test result of materials and work tests will be maintained at the site of work by the Corporation and ever entry thereof shall invariably be signed by the Contractor or his authorized representative in token of its correctness.

Clause – 71: Progress schedule: The Contractor shall furnish, within one month (unless extended by the Engineer in charge) of the order to start the work, the

progress schedule in quadruplicate indicating the date of starting, the monthly progress expected to be achieved and the anticipated completion date of each major item of work to be done by him, also indicating dates of procurement and setting up the materials plants and machinery. The Schedule should include a statement of proposed general and detailed arrangements for carrying out works and of time, order and manner in which it is proposed that these shall be executed. The schedule should be framed keeping requirements of the clause 2 of Tender form in view and be such as in practice to the achievement towards completion of the work in the time limit and of the particular items on the dates specified in the contract and shall have the approval of the Engineer in charge. Further, the dates for the progress, as in this schedule shall be adhered to.

- (a) In case it is found necessary, at any stage, to alter the schedule, the Contractor shall submit in good time. A revised schedule incorporating necessary modifications proposed and get the same approved from the Engineer - in - charge is further empowered to ask for more detailed schedule or schedules, say, week by week, for any item or items and the Contractor shall supply the same as and when asked for.
- (b) The Engineer in charge shall have, at all times, the right, without in any way vitating this contract forming grounds for any claim, to alter the order of the work or any part thereof and the Contractor shall also revise the progress schedules accordingly and submit four copies of the revised schedule to the Engineer - in - charge within seven days of the said Engineer's direction to alter the order of works.
- (c) The Contractor shall furnish sufficient plant, equipment and labour and shall work such hours and shifts as may be necessary to maintain the progress of the work as per approved progress schedule. The working and shift hours shall comply with all Corporation regulations in force and shall be such, as may be approved by the Engineer - in - charge and the same shall not be varied without the prior approval of Engineer - in - charge.
- (d) The Contractor shall from time to time, as may be required by the Engineer - in - charge, furnish the Engineer - in - charge with a statement in writing of the arrangements he proposes to adopt for the execution of this contract and the Engineer - in - charge may, if he considers necessary at any time advise alteration in the same, which the Contractor shall adopt on notice thereof.
- (e) The progress schedule(s) shall be in the form of progress chart, forms, statements and/or reports as may be approved by the Engineer - in - charge
- (f) The approval of the progress schedules by the Engineer - in - charge shall not relieve the Contractor of any of his duties and responsibilities under the contract. The adoption of any modification in the schedule required by the Engineer - in - charge shall not entitle the Contractor to any extra payment.

Clause – 72: Secured advance to contractor :Deleted

Clause – 73 : Advance payment :Deleted

Clause – 74 : Advance against machineries :Deleted

Clause – 75 : Mobilization advance :Deleted

Clause – 76 :Deleted

Clause – 77 :Deleted

Clause – 78 :Deleted

SCHEDULE 'A'

**Schedule Showing (approximately) the materials to be supplied from the
Municipal Corporation Store for Work Contracted to be executed and
The rates at which they are to be charged for**

Particulars	Approx- imate Quantity	Rate at which the materials will be charged to the Contractor		Place delivery
		Unit	Rs.	
	Deleted			

Note – 1 : The person of firm submitting the tender should see that the rates in the above schedule are filled up by the Engineer - in – charge on the issue of the form prior to the submission of the tender.

Note – 2 : Stores to be supplied to Contractors for a work free of cost should be mentioned in Schedule 'A' in addition to Schedule 'B' and the specification attached to the contract agreement form.

Note – 3 : All empty drums involved in the supply by Corporation to the Contractor under this contract shall be returned in undamaged condition within the time prescribed by the Concerned Addl. City Engineer (Water Project) by the Contractor to the original place of delivery. No allowance on account of these empty drums will be made to the Contractor and in the event of non-return, Rs. 65 will be charged to the Contractor for each unreturned drum or badly damage done.

Note – 4 : Empty bags of cement supplied by the Government will be the property of the Contractor and no recovery for the non-return of the same will be made.

SCHEDULE 'B'

Memorandum Showing Items of Works to be carried out

Items No.	Quantities estimated but may be more or less	Item of work	Tender Rate		Unit	Total amount according to estimated quantities
			In figures	In words		
1	2	3	4	5	6	7
			As per separate sheet attached			

I/We am/are willing to carry out the work at _____% above/below (should be written in figures and words) the tendered amount mentioned above. Amount of my / our tender works out as under:

Tender amount _____ Rs.
 _____ Add % above Rs.
 _____ Net Rs. _____
 In words _____

Tender amount Rs. _____
 _____ Deduct %
 below Rs. _____ Net Rs. _____
 In words _____

Note – 1 : All work shall be carried out as per Public Works Corporation Handbook and other specifications of the Division or as directed.

Note – 2 : All the columns in the Schedule should be filled in, in ink and the total of the entries in the last column should be struck by the Contractor under his signature.

Note – 3 : Rates quoted include clearance of site (prior commencement of work and at its close) in all respects and hold good for work under all conditions, site, moisture, weather etc.

Note –4: To be continued on additional sheets, if found necessary.

B-3 : SCHEDULE – B

SECTION : B-3

Item No.	Quantities estimated but may be more or less	Item of work	Estimated Unit ____ rates ____ in in Fig. words	Total amount according to estimated quantities
AS PER SCHEDULE OF QUANTITIES AND RATES IN VOLUME – II.				

- Note1: All works shall be carried out as per specifications of Ahmedabad Municipal Corporation or as directed.
- Note2: Rates quoted include clearance of site (prior to commencement of work and at its close) in all respects and hold good for work under all conditions, site moisture, weather etc.
- Note3: This is for further information of the bidder that schedule of quantities and rates indicated here are in Volume -II of the tender.
- Note4: The bidder should note that no separate payment, whatsoever shall be made for dewatering by using any system and disposal of the pumped water at suitable distance as directed by Engineer-in-charge, if required to be done during excavation, laying, jointing and testing of pipes and excavation for storage reservoirs or any other activity required to be done related to laying of pipes, sump, construction of any kind of manhole, RCC Chambers and excavation if required to be done under wet condition etc. and contractor shall quote accordingly.

Signature of Contractor

Additional City Engineer (Water Project)

Name :

Ahmedabad Municipal Corporation

Company's seal :

Date :

Date :

Note : To be continued on additional sheets, if found necessary

B-4 : GENERAL INSTRUCTIONS

SECTION : B-4

The work shall be completed **within 12 (Twelve)** months including monsoon period after the order to start the work. If the site is not cleared to start the work. The time limit will be considered from the date of possession given to start the work. The details of **Misc. Repair and Maintainance works of Different Water Distribution Station of South West Zone and other zones in under Water Project Dept. A.M.C**

It shall be as per design and instructions of Addl. City Engineer (Water Project) and his order will be considered final. Concrete used for the work, shall be ready mix concrete as per specification specified in volume I, part –II, Section – D6, Clause 6.7.

The Contractor shall have to maintain account of steel, cement and other materials that may be brought by him on site. This account shall be regularly maintained and kept open for inspection by Municipal staff. Watering of all the items shall be done as per instructions. Mixing of concrete shall be done by reversible concrete mixer machine having capacity of 10-12 cubic meter per hour. Arrangements of bringing vibrator for R.C.C. work if required shall have to be made by the Contractor.

The Contractor shall remain responsible for workmen's compensation, if any, when such case occurs. The contractor shall arrange for red lamps at night and fencing and pags and shall be responsible for any damage of life and limb or property, if any happens, during the execution of work. In case of dispute for unseen or overlooked items, the decision of Addl. City Engineer (Water Project) shall be final. The Contractor shall have to give site clean of all rubbish on completion of work and hand over the site with final finishing of the work as directed. All the rejected materials shall be removed from site within 24 hours by Contractor at his risk and cost.

For mixing mortar either for masonry or for plaster or for any other purpose contractor shall have to prepare trough of bigger size and mix the mortar in the trough in required proportion. In no case he shall be allowed to mix the mortar either on floor or any finished surfaces.

The Contractor shall have to make his own arrangement for water required for the work and shall pay the water charges as per the prevailing rates of Corporation based on water meter readings.

If any extra item crops up during the progress of works, the same shall be carried out by the contractor, after approval of competent authority and he shall be paid at the rate fixed by the City Engineer (WRM) as per the rate analysis based on current market rates or current SOR (Year in which extra item executed) or tender SOR (after effect of tender premium / discount) whichever is less.

If in the interest of the AMC it is necessary to change either any site or the design of the proposed work the Contractor shall carry out the same at the quoted rates without charging any extra and he will be paid at the rates quoted by him and no claim for extra for subsequent changes made will be entertained.

The cubical contents of the cement bag shall be taken as 0.03455 Cu.m. per bag and the Contractor shall have to prepare the measure boxes according to this measures.

The R.C.C. or specified work shall not be done on Sunday and holiday except in emergency or when technical requirements are such that continuity of work should be maintained and that too will be with prior permission of the competent authority

All the materials required for the execution of works including cement, sulphate resistance cement, TMT Reinforcement steel, including MS shall have to be brought by the contractor from open market.

Retention money shall be deducted at a rate of 2% from current bills which will be released on time of final bill and certification issued by Engineer in charge to that effect.

Octroi exemption passes shall not be given for any material required for this work.

Contractor will be fully responsible for compliance of the various provisions under Contract Labor Act, 1970 and the Rules frames there under. The Contractor should obtain necessary permissions, license & registrations from labour commissioner, as per labour law.

As per circular No. MGR.2176(96)(ii) dated 31.8.77 issued by Government of Gujarat, Contractors are requested to procure their materials required for construction work through legal sources i.e. Only from the quarry lease-holders, permit holders or middle-man who satisfies the contractor as to the legality of the source of purchase by him of these materials.

The bidder shall note that if the information required to be furnished by him either at the stage of prequalification or at the stage of bidding are not provided in time and its deliberated concealed and such information has come to the notice of AMC at any stage prior to award of Work and whether or not negatively affecting bidders competency the AMC reserve the right to out rightly reject the bid though he is prequalified in the absence of such information.

All charges on account of Octroi terminal entry tax, sales tax, GST, excise duty, royalty etc. and other duties on indigenous material obtained for the works from any source shall be borne by the Contractor. As per the amendment of Sales Tax Act which comes into force from August 1985, Sales Tax on works contracts shall be paid by the Contractor and no reimbursement shall be made by AMC for the same.

Necessary testing of materials shall be carried out by the Contractor at the laboratory approved by AMC. This does not relieve the Contractor from his contractual obligations of making all arrangements for taking samples; take to the laboratory and to keep the necessary records as directed.

The Contractor shall not employ any child below 14 years of age. It is prohibited by Child Labour Prohibition and Regulation Act 1986. Hon'ble Supreme Court has given guide lines and as per those guide lines, if child labour is employed on the work site, the contractor shall have to deposit Rs. 20,000 (Rs. Twenty thousand only) in the child labour welfare fund, and to submit the proof to AMC. If the contractor refuses to deposit this sum, then the contractor shall be sole responsible for the action to be taken for the contempt of Supreme Court judgment and shall be liable for prosecution by the concerned Authority.

The Contractor shall be responsible for the quality and good status of work till the final bill i.e. handover of the work is made to AMC.

The Contractor shall have to submit the running account bill in duplicate. On certificate from the Engineer, the payment shall be released by AMC after proper necessary checking. This procedure shall not absolve the Contractor from the responsibility of timely completion of the work.

I/ We hereby certify that I /We noted the above Important General Instructions and have quoted our rates taking into account these conditions.

Signature of Contractor

Additional City Engineer (Water Project)

Name :

Ahmedabad Municipal Corporation

Company's seal :

Date :

Date :

B-5 : ANNEXURES

SECTION : B-5

Annexures : The information in the following annexure specimens should be furnished on separate letter pad if necessary.

ANNEXURE – 1

(Referred to in Condition No. 2 General Rules and Direction for the guidance of contractors)

To,
The Additional City Engineer

Place:
Date:

Details regarding my / our partners / our company (in the case of limited company)
Names, Address(es), telephone numbers(s) Income Tax etc. are as under:

Sr. No.	Name(s) of person/partner Director of the Company	Full address of the place of business (with pin code)	Telephone No.(s) (Office)	Residential address(es) (Resi.)	Telephone No.(s)	Full address of Income tax office ward where Income tax return is filed
1	2	3	4	5	6	7

I/We hereby agree to intimate to you about change if any, in the above mentioned address(es) and telephone No.(s) within Fifteen days of its occurrence till my / our deposit, for the said work paid by me/us is not returned to me/us.

Dated Signature of Tenderer

Signature of the contractor:

Signature of the Dy. Municipal Commissioner

B-6 : SCHEDULES

SCHEDULE – B.6.1

**DETAILS OF THE WORKS OF SIMILAR TYPE AND MAGNITUDE CARRIED OUT BY THE TENDERER
DURING LAST 7 YEARS PERIOD**

Sr. No	Name of Work	Place and Country	Tendered Cost	Time in which work completed	Date of Completion	Principal Features.

Signature of the Tenderer with
stamp Name :
Company's seal
: Date :

Appendix - C
BIDDING CAPACITY

A) Existing commitments and on-going works

Description of work	Place and State	Contract No. & Date	Name & Address of Employer	Value of works (Rs. in Lacs)	Stipulated period of completion	Value of Works remaining to be completed * (Rs. In Lacs)	Anticipated date of Completion
1	2	3	4	5	6	7	8

* Enclose certificate(s) from Employer or Employer's authorized representative, not below the rank of an Executive Engineer or equivalent.

Signature of Contractor
Name of the Contractor
Date
Stamp of Company

SCHEDULE – B.6.2

DETAILS OF THE WORKS IN HAND AND WORKS TENDERED FOR AS ON THE DATE OF SUBMISSION OF THE TENDER.

Sr. No	Name of Work	Place and Country	WORKS IN HAND			WORKS TENDERED FOR			Remarks
			Tendered Cost	Cost of work remaining to be executed as on date	Anticipate d Date of Completio n	Tender Cost	Date when decision is expected	Stipulated date & period of Completion	

Signature of the Tenderer with
stamp Name :
Company's seal
: Date :

SCHEDULE – B.6.4

INFORMATION REGARDING FINANCIAL CAPACITY OF THE TENDERER.

Sr. No.	Details	Amount	Remarks
1.	Solvency		Solvency Certificate of an amount 20 % of the tender estimated cost shall be enclosed with technical bid.
2.	Annual turnover for last three years: (a) 2024 – 2025 (b) 2023 – 2024 (c) 2022 – 2023		Details of major contracts executed during these years shall be furnished.
3.	Price of the biggest job carried out		Certificate from the owner in support of successful completion of work may be furnished.

Signature of the Tenderer with
stamp Name :
Company's seal
: Date :

SECTION: C

C-1: GENERAL SPECIFICATIONS – NON TECHNICAL

C-2: ADDITIONAL GENERAL CONDITIONS

C-3: SAFETY PROVISIONS

SECTION - C : SPECIFICATIONS : NON-TECHNICAL

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C-1 : GENERAL SPECIFICATIONS

SECTION : C-1

LOCATION AND DESCRIPTION OFWORKS

Misc. Repair and Maintainance works of Different Water Distribution Station of South West Zone and other zones in under Water Project Dept. A.M.C.

DRAWINGS

The work shall agree in all particulars with the contract drawings and amendments to drawings which shall be read in conjunction with the specification. A Schedule of Drawings accompanying the Specifications is given in **Section E**. Further drawings may be issued by the Engineer, if necessary, as the work proceeds.

The enclosed drawings are for the reference of Tenderer and information only, as they are preliminary in nature, Owner/Engineer reserves the right to change the plans, locations, delete or add some parts of the work, etc. if warranted at the time of preparation of detailed drawings or as work proceeds. Contractor will have no claims on Owner/Engineer on this account. Contractor shall carefully scrutinize the drawings and he shall be responsible to point out discrepancy or anomalies if any to the Engineer before execution of the work affected thereby.

Contractor, his employees and agents shall not disclose to anyone any information contained on drawings, or otherwise furnished to him by Owner / Engineer including all drawings, reports etc. prepared by Consultant / Contractor either individually or jointly for the execution of the works without prior approval of Engineer. No photographs of the works or plant within the site premises shall be taken without prior written approval of Owner /Engineer.

ISSUE AND RETURN OF CONTRACT DOCUMENTS -deleted

PROGRAMME OFWORK

The major works to be carried out under this contract form an important part of the AMC Water Supply Scheme. Importance is placed on the proper programming of the civil work with adequate provision for all delays normally encountered.

Notwithstanding the provisions of Clause B.2.6 of the Conditions of Contract, no extension of time will be granted by the Engineer in respect of inclement weather or its effects (such as floods or droughts), fire or industrial disputes unless such events could not reasonably have been foreseen by an experienced Contractor. All allowances to guard against such delays shall be clearly indicated in his programme.

As soon as practicable after acceptance of his tender and in any case before starting work on site, the Contractor shall submit for the Engineer's approval a detailed programme of work in the form of a PERT/CPM Network and a bar chart

together with a description of his proposed methods of working. The programme shall take into account, the importance of completing the various parts of the works in accordance with Clause for time for completion of the Contract.

PROGRESS

The Contractor shall regularly review his programme in the light of the progress actually achieved and shall submit for approval updated PERT/CPM Network and bar charts at intervals to be agreed with the Engineer's Representative. If progress falls behind that needed to ensure timely completion of the various parts of the works, the Contractor shall submit proposals for improving his methods and pace of working to the satisfaction of Engineer's Representative and shall carry out such measures as are needed to ensure that the works are completed on time.

TIME FOR COMPLETION

The time limit for this Contract is **12 (Twelve) calendar month** sincluding of monsoon period. The Contractor shall commence the works on site when ordered by the Engineer and shall proceed with the same with due expedition and without delay except as may be expressly sanctioned or ordered by the Engineer or be wholly beyond the Contractor's control.

CERTIFICATES OF COMPLETION

If the Engineer issues a Certificate of Completion of a part of the works pursuant to Clause B.2.7 of the Conditions of Contract. The Contractor shall as far as practicable finish all outstanding work in that part of the works during the relevant Defects Liability Period. No Certificates of Completion shall relieve the Contractor or any of his obligations in connection with other Contractors whose work is carried out after the issue if such a certificate.

PATENTS, RIGHTS ANDROYALTIES

The Contractor shall save harmless and indemnify the Commissioner and the Corporation from and against all claims and proceedings for or on account of infringement of any patents, rights, design, trade mark or name of other protected rights on respect of any Constructional plant, machine, work or material used for or in connection with the works or temporary works or any of them and from and against all claims, demands, proceedings, damages, costs, charges, and expenses whatsoever in respect thereof or in relation thereto. Except where otherwise specified, the Contractor shall pay all tonnage and other royalties, rent and other payments or compensation if any for getting stone, sand, gravel, clay or other materials required for the works or temporary works or any of them.

THESITE

Tenderer must visit the work site and see for himself the site and ground conditions in all respects including availability of labour (skilled and unskilled), approaches, availability of water, electricity, materials, and all other matters affecting the work before submitting the tender.

The submission of the tender by Tenderer implies that he had visited the work site, read the entire tender document and has made himself aware of the scope of specification of work to be performed and of the conditions and rates at which materials will be issued to him and local conditions and other factors which have a bearing on the execution of work.

Owner will not, therefore, after acceptance of the tender, pay any extra charges for any reason whatsoever in case Contractor find later on to have misjudged the site and other conditions.

ACCESS TO THE SITE

The Contractor shall arrange to construct, maintain and afterwards remove and reinstate any temporary access required for and in connection with the execution of the works. Reinstatement shall include restoring the area of the access route to at least the degree of safety, stability, drainage and appearance that existed before the Contractor entered the site.

GEOLOGICAL INFORMATION

The Contractor has to visit the site and assess the geo-logical strata available at the site and presence of sub-soil water land. Contractor shall have to a quote accordingly. Considering the site situation.

SETTING OUT THE WORKS

The Contractor shall be responsible for the true and proper setting out of the works in relation to original points, lines and levels of reference given by the Engineer in writing or shown on the Drawings and for correctness, subject as above mentioned in the position, levels, dimensions and alignment of all parts of the works and for the provision of all necessary instruments, appliances and labour in connection therewith.

The checking of any setting out of any line or level by the Engineer's Representative shall not in any way relieve the Contractor of his responsibility for the correctness thereof.

TEMPORARY WORKS

A reasonable time (in any case not less than 28 days) before he intends to commence construction of any temporary works, the Contractor shall submit full particulars including drawings of the same for the approval of the Engineer's Representative. Submission to an approval by the Engineer's Representative of any such particulars shall not relieve the Contractor of any of his responsibilities under the Contract.

AMENITIES TO BE PRESERVED

The Contractor shall cause the least possible interference with the existing amenities, whether natural or man made. No tree shall be felled without

Permission of the Engineer's Representative and clearance of the site shall generally be kept to the minimum necessary for the works and temporary works. Temporary works shall be sited so as minimize the number of trees to be felled.

WORKS TO BE KEPT CLEAR OF WATER

The Contractor shall keep the works well drained until the Engineer certifies that the whole of the works is substantially complete and shall ensure that so far as is practicable, all work is carried out in the dry. Excavated areas shall be kept well drained and free from standing water.

The Contractor shall construct, operate and maintain all temporary dams, watercourses and other works of all kinds including pumping and well-point dewatering that may be necessary to exclude water from the works while they are in progress and till they are handed over to the Corporation. This refers mainly to surface water that may enter into the excavated construction work. No separate payment will be made for such dewatering works / measures. Unit rates quoted by Contractor will be deemed to have covered expenses for such dewatering works / increase. Such temporary works shall not be removed without the approval of the Engineer's Representative.

Notwithstanding any approval by the Engineer's Representative of the Contractor's arrangements for the exclusive of water, the Contractor shall be responsible for the sufficiency thereof and for keeping the Works safe at all times, particularly during any floods and for making good at his own expense any damage to the works including any that may be attributable to floods. Any loss of production or additional costs of any kind that may result from floods shall be at the Contractor's own risk.

DISCHARGE OF WATER INTO EXISTING WATERCOURSES

The Contractor shall make provision for the discharge or disposal from the works and temporary works of all water and waste products howsoever arising and the methods of disposal shall be to the satisfaction of the Engineer's Representative and of any Authority of person having an interest in any land or watercourse or in which waste may be so discharged. The requirements of this clause shall not limit any of the Contractor's obligations or liabilities.

PREVENTIVE MEASURES OF POLLUTION

The Contractor shall ensure that all times during the construction of the works all reasonable precautions are taken to the satisfaction of the Engineer's Representative to prevent pollution of the site and of the environment. In particular, the Contractor shall prevent pollution arising from the disposal or spillage of sewage, diesel fuel, oil, liquid mud, or from the disturbance of natural dust, aggregate dust or cement dust.

EFFECTS OF WEATHER

The Contractor shall ensure that no damage occurs to the works during construction by arranging adequate protection for excavation or building work

Against the effects of drought, sunshine, wind or rainfall (including erosion and flooding). No work shall be performed when in the opinion of the Engineer's Representative such work is liable to be injuriously affected by the weather. The Contractor shall have no claim against the Corporation on account of loss alleged to have been sustained directly or indirectly by reason of the Engineer's Representative declining to permit such work to start or continue, or ordering any work damaged by the weather to be made good or removed and re-executed.

SITE TO BE KEPT TIDY

The Contractor shall keep the site and all working areas in a tidy and workman like condition and free from rubbish and waste materials. Any temporary works, constructional plant, materials or other things which for the time being are not required for use by the Contractor may with the consent of the Engineer's Representative be removed from the site but otherwise shall be dispersed about the site in an orderly fashion and shall be properly and securely stored thereon.

SAFETY MEASURES AND SERVICES

The Contractor shall be responsible for the safety of all workmen and other persons entering or in the works and shall take all measures necessary to ensure their safety to the approval of the Engineer's Representative. Reference in these respects shall also be made to the Conditions of Contract and safety provisions but in particular, such measures shall include the following:

- (a) Provision of proper safety and emergency regulations' fire, gas and electric shock precautions, stretchers and first-aid box together with rescue facilities generally for each place of working;
- (b) Provision of efficient safety helmets for all personnel including the Engineer's Representative and each of his staff and any authorized visitors to site;
- (c) Safe control of water including provision of ample standby generating and pumping plant;
- (d) Provision and maintenance of suitable lighting to provide adequate illumination of works with appropriate spares and stand by equipment;
- (e) Provision and maintenance of safe, sound mechanical equipment, each item of plant having an up-to-date testing certificates;
- (f) Provision and maintenance of safe, sound, ropes, slings, pulleys and other lifting tackle, each appliance having an up-to-date testing certificate where appropriate;
- (g) Provision of notices 1.25 m x 1.5 m size written in bold letters in English, Gujarati and Hindi to be erected on existing footpaths and at points of access likely to be used by the public, which shall warn the public of the Works. These notices shall be in addition to any statutory requirements demanded of the Contractor.

The Contractor shall submit for the approval of the Engineer's Representative detailed proposals under (a) above. When the regulations have been approved and before the work started, the Contractor shall distribute copies in English or in other languages as appropriate to all his employees and to the Engineer's Representative.

The Contractor shall ensure that all his employee are fully conversant with the regulation, emergency and rescue procedures, etc. and the Contractor shall enforce the rule that any employee committing a serious breach of such a regulations shall be instantly dismissed and shall no be re-employed.

Contractor shall provide and maintain at his own expenses all lights, guards, fencing and necessary watchmen when and where necessary or ad required by Owner / Engineer for the protection of the works or for the safety and convenience of those employed on the works and the public. Contractor shall also provide at his cost traffic barricades, men for diverting and controlling traffic, necessary sign boards for diversion of traffic. In the event of failure on the part of Contractor, Owner man with or without notice to Contractor put up a fence or improve a fence already put up or provide and/or improve the lighting or adopt such other measures as he may deem necessary, and all the cost of such work and procedures as may be adopted by Owner / Engineer shall be borne by Contractor. Maintenance of adequate warning and general lighting at nights a t place of work is essential.

Contractor shall take the necessary permission and clearance of all the authorities like department of Roads, traffic, Water Supply and Drainage; Electricity Board, Telephone Company, etc. Wherever necessary and observe the regulations regarding the execution of work in congested areas, heavy traffic areas, etc.

CLAIMS FOR DAMAGE TO PERSONS ORPROPERTY

Any claim received by the Corporation or the Engineer's Representative in respect of matters in which the Contractor is required under the Contract to indemnify the Corporation will be passed to the Contractor who shall likewise inform the Corporation and the Engineer's Representative of any such claim which is submitted directly to him by a claimant. The Contractor shall do everything necessary, including notifying the insures of claims received, to ensure that all claims are settled properly and expeditiously and shall keep the Corporation and the Engineer's Representative informed as to the progress made towards settlement, failing which the Corporation shall be entitled to make direct payment to claimants of all outstanding amounts due to them in the Corporations. Opinion and without prejudice to any other method of recovery to deduct by way of offset the amounts so paid from any sums due or which become due from the Corporation to the Contract.

If the Contractor receives a claim which he considers to be in respect of matters in which he is indemnified by the Corporation under the Contract, he shall immediately pass such claims to the Corporation.

Contractor will be solely responsible for any loss to life or limbs of workmen or the public arising out of inadequate protective and/or safety measures taken by Contractor and irrespective of whether or not Engineer has ordered Contractor to take protective and safety measures.

ASSISTANCE FOR THE ENGINEER'S STAFF

The Contractor shall provide all necessary assistance to the Engineer's Representative and his staff in carrying out their duties of checking the setting out, inspecting and measuring the work. The Contractor shall provide necessary assistance including labourers as may be needed from time to time by the Engineer's Representative.

The Contractor shall provide for the Engineer's Representative and his staff such protective clothing, safety helmets and rubber boots of suitable sizes as may reasonably be required by them. These articles shall remain the property of the Contractor. No separate payment shall be made on this account.

PUBLICITY NOTICEBOARD

In addition to Clause C.1.20.1 (g) above, the Contractor shall provide, maintain and remove at the end of the Defects Liability Period a publicity notice board constructed according to the requirements of the Corporation.

CLEARING SITE ON COMPLETION

On completion of the Works, the Contractor shall clear away and remove from the site all Constructional Plant, surplus materials, rubbish, Temporary Works of every kind and leave the whole of the site and the works clean and in a workmanlike condition to the satisfaction of the Engineer.

The Contractor shall comply with the above requirements before the start of the Defects Liability Period and by the end of that period shall clear, regrade terrace, level topsoil and grass all his working areas as instructed by the Engineer's Representative. No separate payment shall be made on his account.

FORMS OF MONTHLY STATEMENTS

The Contractor shall raise the monthly bill as per Clause No. B.2.10 of Section 'B-2'.

PRODUCTION OF VOUCHERS, ETC.

The Contractor shall when required by the Engineer produce all quotations, invoices, vouchers, and accounts or receipts in connection with expenditure in respect of provisional sums.

The contractor shall furnish to the Engineer's Representative such receipts or other vouchers as may be necessary to provide the amounts paid and before ordering materials shall submit to the Engineer quotations for the same for his approval.

DAYWORK

In respect of all work executed on a day work basis, the Contractor shall during the continuance of such work deliver each day to the Engineer's Representative an exact list in duplicate of the names, occupations and time of all workmen employed on such work and a statement also in duplicate showing the description and quantity of all materials and plant used thereon or therefore (other the Schedule here in above referred to). One copy of each list and statement will if correct or when agreed to, be signed by the Engineer's Representative and returned to the Contractor. At the end of each month, the Contractor shall deliver to the Engineer's Representative a priced statement of the labour, materials and plant (except as aforesaid) used and the Contractor shall not be entitled to any payment unless such lists and statements have been fully and punctually rendered. Providing always that is the Engineer shall consider that for any reason the sending of such list of statement by the Contractor in accordance with the foregoing provision was impracticable, he shall nevertheless be entitled to authorize payment for such work either as day work (on being satisfied as to the time employed and plant and materials used on such work), or at such value therefore as shall in his opinion be fair and reasonable.

CLAIMS

The Contractor shall send to the Engineer's Representative once in every month an account giving particulars (as full and detailed as possible) of all claims for any additional expense to which the Contractor may consider himself entitled and of all extra or additional work ordered by the Engineer which he has executed during the preceding month and no claim for payment for any such work will be considered which has not been included in such particulars. Provided always that the Engineer shall be entitled to authorize payment to made for any such work notwithstanding the Contractor's failure to comply with this condition if the Contractor has at the earliest practicable opportunity notified the Engineer that he intends to make claim for such work.

ENGINEER'S REPRESENTATIVE

Where reference in the specification is made to the Engineer, the powers as described shall be deemed to be delegated to the Engineer's Representative.

SUBSIDENCE OF ROAD

If any subsidence takes place in the filling of road or any part of the work whatsoever during defects liability period from the completion of the contracted work, Contractor shall make good the same at his own cost, or Owner / Engineer may without notice to Contractor make good the same in any and with any material that he may think proper and at the expense of Contractor. Owner / Engineer may also of he anticipates the occurrence of any subsidence, employ watchmen to look after the same unless it has been set right. The expenses of such watchmen shall be charged to Contractor.

QUALIFICATION AND EXPERIENCE OF TENDERER

Engineer will review the qualification and experience of the Tenderers in respect of

- (a) Past experience
- (b) Major works on hand
- (c) Technical personnel
- (d) Financial capacity
- (e) Method of construction equipment proposed to be used
- (f) Any other relevant information.
- (g) Method of Dewatering

For this purpose, tenderers are requested to furnish information, in the Schedules 1 to 9 enclosed. The above information shall be specific, self-explanatory and must bring out the qualifications and experience of the Tenderer intending to carry out this Contract. Engineer reserves the right to reject any offer which, in the opinion of the Engineer, has been made by a Tenderer who does not qualify to meet the standards by way of experience, resources, technical skills, expected of him.

If the tender is submitted by a group of firms, it is necessary that the sponsoring firm submits separate and complete information about each firm in the group and identify those who have the responsibility for the execution of the work. It shall be clearly established in the tender as to who will be the lead firm and the expected participation or share of each of the members of the group.

PAYMENT OF ITEMS ON LUMP SUM BASIS

Items to be paid on "Lumpsum" basis shall be paid only after these items are accepted by Engineer as 100% complete.

INTERPRETATION OF DOCUMENTS

Tenderers shall carefully examine the Tender documents and fully inform themselves as to all the conditions and matters which may in any way affect the work or the cost thereof. Should a tenderer find discrepancies in or omission from the specification or other document, or should he be in doubt as to their meaning, he should at once address a query to the Addl. City Engineer (Water Project). Any resulting interpretation of the Tender Documents will be issued to all tenderers as

an addendum. Verbal clarification and/or information given by the Addl. City Engineer (Water Project) shall not be binding on the Corporation.

ERRORS AND DISCREPANCIES INTENDERS

Should the Schedule of Quantities and Rates submitted with the tender be found to contain errors such as adding mistakes, incorrect transference and discrepancies between rates and amounts, the Engineer will advise the tenderer of any errors and discrepancies as aforesaid which may have been found in the Schedule of Quantities and Rates and after discussions with the Tenderer, will make such amendments (and no others) as are proper to resolve the errors and discrepancies as aforesaid and will retotal the amount in Schedule of Quantities and Rates.

In general the quoted unit price in the original tender will apply when discrepancies arise with the extended price.

The foregoing procedure may be applied at any time prior to the acceptance of a tender, but the Engineer undertakes no responsibility towards any tenderer for any error or discrepancy which is not discovered during Engineer's Examination of tenders.

INFORMATION FURNISHED

The information given to Tenderers in this tender document comprising of all parts is given in good faith and meant to serve only as a guide. Owner / Engineer will not hold himself responsible if any such information given for the guidance of Contractor is found to be incorrect, partly or in whole and or any deductions, conclusions or interpretation drawn by Contractor. It is, therefore, imperative that Tenderer must obtain and examine for himself all data, information and particulars required for the satisfactory execution of the work.

PAYMENTTERMS

The terms of payment are defined in the section B. The Corporation shall not under any circumstances relax these terms of payment and will not consider any alternative payment terms. Tenderers should therefore in their own interest note this provision to avoid rejection of their tenders. Contractor will not be entitled for any claim, compensation or interest for any delayed payments.

BRANDNAMES

Specific reference in the specification to any material by trade name or catalogue number shall be constructed as establishing a standard of quality and performance and not as limiting completion and tenderers, in such cases, may at their option freely use any other product provided that it ensures an equal or higher quality than the standard mentioned and meets the Engineer's approval.

EQUIPMENT FOR EXCAVATION

Excavation shall be mechanised, except in local developed areas, to expedite the work and the contractor has to submit a complete list of equipment he proposes to deploy on this work along with the tender. Tenderer not complying with this requirement may be considered non-responsive and his tender is liable to be rejected.

MATERIALTESTING

Necessary material testing shall be carried out by contractor in presence of AMC engineers at AMC laboratory or any other Government approved laboratory at his own cost as directed by Engineer-in-charge. The material testing fee at the rate of 0.5% shall be deducted from every running bill of the contractor. This does not relieve contractor from his contractual obligations of making all arrangements for taking samples during each concreting, curing for the specified period as per specifications, bring to the laboratory and keeping the necessary records as directed.

At the time of final bill, the amount deducted from each running bill shall be adjusted with the actual material testing fees and the balance amount if any will be refunded to or recovered from the contractor.

RECORD OF LABOUREMPLOYED

Contractor shall keep record in the form of daily registers for the labourers and other working staff employed on the work site. The same should be kept open for the inspection of AMC.

EXTRA ITEM OFWORK

If any extra item crops up during the progress of works, the same shall be carried out by the contractor, after approval of competent authority and he shall be paid at the rate fixed by the City Engineer (WRM) as per the rate analysis based on current market rates or current SOR (Year in which extra item executed) or tender SOR (aftereffect of tender premium / discount) whichever is less.

DISPUTES

Any legal dispute with the Contractor(s) will be referred to the court of law and will be settled within the area subject the Ahmedabad jurisdiction.

C.1.44 ANNEXURES

ANNEXURE – C.1.44 (A)

WATER SUPPLY AND ELECTRICITY

1.0 WATERSUPPLY

Contractor shall make his own arrangement for water supply at his own cost and nothing extra shall be paid by the Corporation. This applies to water required for testing purpose also. The Contractor can, however, construct a tube-well or a pipeline at his convenience on nearby AMC land if available with prior approval of AMC. Contractor will be responsible for all costs of tube well, pumping, laying of necessary pipe lines, installation of meter, storage, maintenance and ultimate removal of the same.

Bidder, if proposes to use Ground Water for construction at site, the same may be used if found potable. He shall arrange to carry out necessary test in approved laboratory on his own to ascertain water quality and that it is potable and obtain prior permission of AMC / NagarPalika to use the same.

However if municipal water pipeline is available nearby then water shall be supplied to the Contractor at his cost on the metering basis at the rate of Rs. 12 / 1000 litres of water for construction purpose. Contractor shall bear all the cost of C. I. pipeline specials & installation of Water meter as per approval of Engineer in Charge.

2.0 ELECTRICITY

Contractor will have to make all arrangements for obtaining power connection, the installation, operation, maintenance and subsequent removal of temporary supply of electricity. AMC shall issue only authorization letter to Contractor for obtaining power connection, and yet if power is not available in time, the work shall not be postponed and the Contractor shall have to arrange for diesel generating set (s) at his own cost. However if AMC / Nagarpalika Power Supply is available nearby then power shall be supplied to the Contractor at his cost on the metering basis at the rate of Rs. 11/KW of Electricity for construction purpose.

Signature of Contractor

Addl. City Engineer (Water Project)

Name :

Ahmedabad Municipal Corporation

Company's seal :

Date :

Date :

ANNEXURE – C.1.44 (B)

CEMENT AND STEEL

Cement and Steel required for this work as well as for manufacture of pipes, Ready mix concrete (RMC), etc., precast elements if any shall be procured by contractor and will have to submit the bill for price escalation as per clause no. 60A. Contractor shall not be paid for any transport, handling and storage expenses separately and he shall quote for the works accordingly to be brought to the site of work.

Test certificate for cement and steel shall be obtained and submitted by the Contractor. Contractor shall have to produce test certificates for procurement of cement and steel.

Cement-OPC shall be of Ambuja, Ultra tech, Kamal/Lotus, Hathi, Jaypee, Sanghi, Binani, ACC, JK Laxmi, Sidhhi or other major cement plant make approved by City Engineer (WRM) Ahmedabad Municipal Corporation.

TMT reinforcement steel(Fe 500) shall be as per IS 1786-1985 REAFFIRMED-2005 like Tata, SAIL, VIZAG, ASR Thermex, Electroplus, Vinayak, NRE, GOD Parmeshwar, Sulekhrarn, Electrotherm or manufactured from prime manufacturing unit as approved by City Engineer (WRM) Ahmedabad Municipal Corporation.

Signature of Contractor

Addl. City Engineer (Water Project)

Name :

Ahmedabad Municipal Corporation

Company's seal :

Date :

Date :

ANNEXURE — C.1.44 (C)
SITE ENVIRONMENTAL CONDITIONS

1. Client ÷ Ahmedabad Municipal Corporation
2. Consultant ÷ —
3. Project Title ÷ ~~Misc. Repairing work on ARC Basis at Kotarpur water treatment plant under Water Project in A.M.C.,~~
4. Location ÷ ~~Kotarpur Water Works Area of~~ Ahmedabad
5. Nearest Railway Station/Town ÷ Ahmedabad
6. Nearest Airport ÷ Ahmedabad
7. Access Road ÷ National Highway No. 8
8. Altitude ÷ 49 M above MSL
9. Ambient Air Temperature ÷ (a) ~~Maximum : 47⁰ C~~
(b) ~~Minimum : 4⁰ C~~
10. Rainfall ÷ (a) ~~Annual Average : 75cms.~~
(b) ~~June to September~~
11. Climatic Condition ÷ ~~Extreme : in winter, cold and In summer, hot~~
12. Seismic Data ÷ (a) ~~Zone as per I. S. 1893 — Zone III~~
13. Ground water Table ÷ ~~As per Soil Exploration Data available~~

Signature of Contractor _____ Addl. City Engineer (Water Project)

Name _____ : _____ Ahmedabad Municipal Corporation

Company's seal _____ :

ANNEXURE – C.1.44 (D)

DEFECTS LIABILITY PERIOD AND REFUND OF SECURITY DEPOSIT

The Defects Liability Period shall be as under and the amount of Security Deposit in the form of Bank Guarantee for the works under different items of contract after completion of the works shall be refunded as under:

Sr. No	Security Deposit & Retention Money	Amount of Retention money to be refunded on completion of work and certification issued by Engineer -In – Charge that effect	Remarks
1	5% of Contract value as Security Deposit.	Contractor shall provide a Bank Guarantee of 5% of Contract value, valid for 12 months, before start of work as security deposit.	
2	2% from each running bill shall be deducted as retention money	The retention money shall be released at the end of successful completion of work and certificate issued by Engineer in charge to that effect.	
3	Material Testing Fee 0.5% shall be deducted from every running bill of the contractor.	At the time of final bill, the amount deducted from each running bill shall be adjusted with the actual material testing fees and the balance amount, if any will be refunded to or recovered from the contractor.	
4	5% of contract value as Performance Bond	Performance Bond shall be submitted by the contractor after completion and handing over of work. Security deposit may also be converted into performance bond and shall be released after the defect liability period.	

The Defect Liability period shall be as under:

12 months after commissioning of total project, as well as issuance of certificate of completion of project by Engineer in charge.

Signature of Contractor

Additional City Engineer (Water Project)

Name :

Ahmedabad Municipal Corporation

Company's seal :

Date :

Date :

C-2: ADDITIONAL GENERAL CONDITIONS

SECTION: C-2

TAXES AND DUTIES ON INDIGENOUS MATERIAL

All charges on account of Octroi, Terminal Entry Tax, Sales Tax, Excise Duty, GST etc and other duties on indigenous material obtained for the works from any source shall be borne by the contractor (subject to provisions made in the tender). As per the amendment of Sales Tax Act which came into force from Aug. 1985, Sales Tax on Works Contracts shall be paid by the Contractor and no reimbursement will be made by the Municipal Corporation for the same.

RATES FOR EXTRA ITEM

Please refer Clause No. 14.4 of Section – B2.

FINANCIAL BID

Financial bid should not contain any condition or enclosures except the quoted item wise rates and the total amount for the work.

BILLS TO BE SUBMITTED MONTHLY

For the works costing above Rs. 10,00,000. Payment will be made once in month. However, another payment will be made as desired by contractor and as agreed by AMC.

MATERIAL TESTING

Necessary material testing shall be carried out by contractor at AMC laboratory or any other Government approved laboratory at his own cost as directed by Engineer-in-charge. The material testing fee at the rate 0.5% shall be deducted from every running bill of the contractor. This does not relieve contractor from his contractual obligations of making all the arrangements for taking samples during each concreting, curing for the specified period as per specifications, bring to the laboratory and keeping the necessary records as directed.

At the time of final bill, the amount deducted from each running bill shall be adjusted with the actual material testing fees and the balance amount, if any will be refunded to or recovered from the contractor.

CHILDLABOUR

The contractor shall not employ any child below 14 years of age. It is prohibited by Child Labour Prohibition and Regulation Act. 1986. Honorable Supreme Court has given guidelines and as per those guidelines, if child labour is employed on the work site, the contractor shall have to deposit Rs. 20000 (Rupees Twenty Thousand Only) in the child labour welfare fund. If the contractor refuses to deposit this sum, then the action will be taken for contempt of Supreme Court Judgement and also will be prosecuted by the concerned authority.

In case of provision of Child Labour Prohibition and Regulation Act,1986 by the contractor and to that Municipal Corporation shall recover the amount from the contractor.

I/We hereby do certify that I/We have taken the above “Additional General & Technical Conditions” into account while bidding and have quoted our firm price accordingly.

Signature of Contractor

Additional City Engineer (Water Project)

Name :

Ahmedabad Municipal Corporation

Company's seal:

Date :

Date :

C-3 : SAFETY PROVISIONS

SECTION : C-3

Suitable scaffolds shall be provided for workmen for all that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used, an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than $\frac{1}{4}$ to 1 ($\frac{1}{4}$ horizontal and 1 vertical).

Scaffolding or staging more than 3.25 metres above the ground or floor, swung or suspended from an overhead support, or erected with stationery support, shall have a guardrail properly attached, bolted, braced, and otherwise secured at least

1 metre high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

Working platforms, gangways, and stairways shall be so constructed that they do not sag unduly or unequally, and if height of a platform or gangway or stairway is more than 3.25 metres above ground level or floor level, it shall be closely boarded, have adequate width and be suitably fenced as described in 2 above.

Every opening in floor of a building or in a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing with a minimum height of 1 metre.

Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 3 metres in length. Width between side rails in a rung ladder shall in no case be less than 30 cm for ladder up to and including 3 metres in length. For longer ladders, this width shall be increased by at least 6 mm for each additional 30 cm of length. Uniform step spacing shall not exceed 30cm.

Adequate precautions shall be taken to prevent danger from electrical equipment. No material on any of the sites shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The Contractor shall provide all necessary fencing and lights to protect public from accidents and shall be bound to bear expenses of defense of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay all damages and costs which may be awarded in any suit, action or proceedings to any such person or which may with the consent of the Corporation be paid to compromise any claim by any such person.

Excavation and Trenching: All trenches, 1.5 metres or more in depth, shall at all time be supplied with at least one ladder for each 30 metres in length or fraction thereof. Ladder shall be extended from bottom of trench to at least 1 metre above surface of the ground. Sides of a trench which is 1.5 metres or more in depth shall be stepped back to give suitable slope, or securely held by timber bracing, so as to avoid the danger of sides collapsing. Excavated material shall not be placed within 1.5 metres of edge of trench or half of depth of trench, whichever is more. Cutting shall be done from top to bottom. Under no circumstance shall undermining or undercutting be done.

Demolition : Before any demolition work is commenced and also during the process of the work:

- (a) All roads and open area adjacent to the work site shall either be closed or suitably protected.
- (b) No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by operator shall remain electrically charged.
- (c) All practical steps shall be taken to prevent danger to persons employed, from risk of fire or explosion, or flooding. No floor, roof, or other part of a building shall be so over-loaded with debris or materials as to render it unsafe.

All necessary personal safety equipment as considered adequate by the Engineer shall be available for use of persons employed on the site and maintained in a condition suitable for immediate use, and the Contractor shall take adequate steps to ensure proper use of equipment by those concerned.

- (a) Workers employed on mixing asphaltic materials, cement and lime mortars/concrete shall be provided with protective footwear, hand gloves and goggles.
- (b) Those engaged in handling any material which is injurious to eyes shall be provided with protective goggles.
- (c) Those engaged in welding works shall be provided with welder's protective eye-shields.
- (d) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
- (e) When workers are employed in sewers and manholes, which are in use, the Contractor shall ensure that manhole covers are opened and manholes are ventilated at least for an hour before workers are allowed to get into them. Manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to public.
- (f) The Contractor shall not employ men below the age of 18 and women on the work of painting with products containing lead in any form. Whenever men above the ages of 18 are employed on the work of lead painting, the following precautions shall be taken:
 - i. No paint containing lead or lead products shall be used except in the form of paste or readymade paint.

- ii. Suitable face masks shall be supplied for use by workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scraped.
- iii. Overalls shall be supplied by the Contractor to workmen and adequate facilities shall be provided to enable working painters to wash during and on cessation of work.

When work is done near any place where there is a risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

Use of hoisting machines and tackle including their attachments, anchorage, and supports shall conform to the following:

- (i) These shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept in good repair and in good working order.
- (ii) Every rope used in hoisting or lowering materials or as a means of suspension shall be durable quality and adequate strength, and free from patent defects.

Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in charge of any hoisting machine including any scaffold winch or give signals to operator.

In case of every hoisting machine and of every chain ring hook, shackle, swivel and pulley block used in hoisting or lowering or as means of suspension, safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with safe working load. In case of a hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated.. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of testing.

In case of departmental machine, safe working load shall be notified by the Engineer. As regards Contractor's machine, the Contractor shall notify safe working load of each machine to the Engineer whenever he brings it to site of work and get it verified by the Engineer.

Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards, hoisting appliances shall be provided with such means as will reduce to the minimum risk of accidental descent of load adequate precautions shall be taken to reduce to the minimum risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energised, insulating mats, wearing apparel such as gloves, sleeves and boots, as may be necessary, shall be provided. Workers shall not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in a safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at or near places of work.

These safety provisions shall be brought to the notice of all concerned by display on a notice board at a prominent place at the work spot. Persons responsible for ensuring compliance with the Safety Provisions shall be named therein by the Contractor.

To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the Contractor shall be open to inspection by the Engineer or his representative and the Inspecting Officers.

Notwithstanding the above provisions 1 to 15, the Contractor is not exempted from the operation of any other Act or Rule in force.

Signature of Contractor		Additional City Engineer (Water Project)
Name	:	Ahmedabad Municipal Corporation
Company's seal	:	
Date	:	Date :

SECTION : D

TECHNICAL SPECIFICATIONS

VOLUME – I: TECHNICAL BID

PART - II: TECHNICAL SPECIFICATIONS

SECTION – ‘D’: CIVIL WORKS

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Sr. No.	Items	
1.	D – 1 :	Earth work in Excavation and Backfilling
2.	D – 2 :	Timber shoring
3.	D – 3 :	Dewatering
4.	D – 4 :	Rain Water Drainage in excavated area
5.	D – 5 :	Site Filling
6.	D – 6 :	Concrete Works
7.	D – 7 :	General Building Works and additional specifications
8.	D – 8 :	Supply and fabrication of structural steel
9.	D – 9 :	Cast Iron & Ductile Iron pipes, valves and fittings
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11.	D – 11 :	Construction of manholes, chambers and Vent shafts
12.	D – 12 :	Specific technical requirements for construction of water distribution station and Allied works
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16.	D - 16:	Miscellaneous Items
17.	D - 17:	Self-Supported Roofing System

D-1: EARTH WORK IN EXCAVATION AND BACK FILLING

SECTION: D-1

D.1.1 SCOPE

- D.1.1.1 This specification covers the general requirements of earth work in excavation for sump and allied works like pipe trench, frame work etc. in different materials, filling in areas as shown in drawing, filling back around foundations trenches, conveyance and disposal of surplus spoils or stacking them properly as shown on the drawings and as directed by engineer and all operations covered within the intent and purpose of this specification.

D.1.2 APPLICABLE CODES

- D.1.2.1 The following Indian Standard codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to.

- | | | |
|----|----------------|---|
| 1. | IS 783 | - Code of practice for laying of concrete pipes |
| 2. | IS 1200 | - Method of measurement of building |
| 3. | IS 3764 | - Safety code for excavation |
| 4. | IS 3385 | - Code of practice for measurement of Civil Engineering works |
| 5. | IS 2720 | - Methods of test for soils |
| | Part – I | - Preparation of dry soil samples for various tests. |
| | Part – II | - Determination of water content. |
| | Part – IV | - Grain size analysis. |
| | Part – V | - Determination of liquid and plastic limit. |
| | Part – VII | - Determination of water content dry density relation using light compensation. |
| | Part – IX | - Determination of dry density – moisture content relation by constant weight of soil method. |
| | Part – XIV | - Determination of density index (relative density) of cohesionless soils. |
| | Part – XXVIII | - Determination of dry density of soils in place, by the sand replacement method. |
| | Part – XXXIII | - Determination of the density in place by ring and water replacement method. |
| | Part – XXXIV | - Determination of density of soil in place rubber baloon method. |
| | Part - XXXVIII | - Compaction control test (Hilf Method) |

D.1.3 DEFINITIONS

- D.1.3.1 The following terms shall have the meanings hereby assigned to them
- **Top Soil** - means any surface material including turf, suitable for use in soiling areas to be grassed or cultivated.
 - **Excavation** – means excavation in open cut down to levels required as per approved drawings or otherwise as being the general levels after completion of excavation.

D.1.3.2 Drawings

- D.1.3.2.1 Engineer will furnish drawings wherever, in his opinion, such drawings are required to show areas to be excavated / filled grade level, sequence of priorities etc. The contractor shall follow strictly such drawings.

D.1.4 GENERAL

- D.1.4.1 Contractor shall furnish all tools, plants, instruments, qualified supervision, personnel, labour, materials any temporary works, consumables, any everything necessary, whether or not such items are specifically stated here for completion of the job in accordance with specification requirements.

- D.1.4.2 Contractor shall carry out the survey of the site before excavation and properly establish line and levels for various works such as earthwork excavation for grading, basement, foundations, plinth filling, roads, drains, cable trenches, pipelines etc. Such survey shall be carried out by taking accurate cross sections of the area perpendicular to established reference / grid lines at 8 m. intervals or nearer as determined by Engineer based on ground profile. These shall be checked by Engineer and thereafter properly recorded.

- D.1.4.3 The excavation shall be done to correct lines and levels. This shall also include, where required, proper shoring to maintain excavations and also furnishing, erecting and maintaining or substantial barricades around excavated areas and warning lamps at night for ensuring safety.

- D.1.4.4 The rates quoted shall also include for dumping of excavated materials in regular heaps, bunds, rip rap with regular slopes as directed by Engineer, within the lead specified and leveling the same so as to provide natural drainage. Rock / soil excavated shall be stacked properly as directed by Engineer. As a rule, all softer material shall be laid along the center of heaps, the harder and more weather resisting materials forming the casing on the sides and the top. Rock shall be stacked separately.

D.1.4.5 Carting and Recarting of the excavated material

- D.1.4.5.1 The rates quoted shall also include the carting and stacking properly or spreading the excavated stuff with a lead of 50 m and recarting the same to the site for backfilling the trenches with the selected excavated materials as directed by Engineer in charge.

D.1.5 CLEARING

- D.1.5.1 The area to be excavated filled shall be cleared of fences, trees, plants, logs, stumps, bush, vegetation, rubbish, slush etc. and other objectionable matter. If any roots or stumps of trees are met during excavation, they shall also be removed. The material so removed shall be burnt or disposed off as directed by Engineer. Where earth fill is intended, the area shall be stripped of all loose/soft patches, top soil containing objectionable matter / materials before fill commences.

D.1.6 PRECIOUS OBJECTS, RELICS, OBJECTS OF ANTIQUITY ETC.

- D.1.6.1 All gold, silver, oil, minerals, archaeological and other findings of importance, trees cut or other materials of any description and all precious stones, coins, treasures, relics, antiquities and other similar things which may be found in or upon the site shall be the property of Client and Contractor shall duly preserve the same to the satisfaction of Owner

and from time to time deliver the same to such person or persons as Owner may from time to time authorize or appoint to receive the same.

D.1.7 CLASSIFICATION

D.1.7.1 All materials to be excavated shall be classified by Engineer, into one of the following classes and shall be paid for at the rate tendered for that particular class of material. No distinction shall be made whether the material is dry, moist or wet. The decision of Engineer regarding the classification of the material shall be final and binding on Contractor and not be a subject matter of any appeal or arbitration.

D.1.7.2 Any earthwork will be classified under any of the following categories:

D.1.7.2.1 Ordinary and Hard Soils

These shall include all kinds of solid containing kankar, sand, silt, moorum and / or shingle, gravel, clay, loam, peat, ash, shale etc. which can generally be excavated by spade, pick axes and shovel, and which is not classified under “soft and decomposed rock” and “hard rock” defined below. This shall also include embedded rock bounders not longer than 1 meter in any one direction and not more than 200 mm in any one of the other two directions.

D.1.7.2.2 Soft and Decomposed Rock

This shall include rock, boulders, slag, chalk, state, hard mica schist, laterite and all other materials which in the opinion of Engineer is rock, but does not need blasting and could be removed with picks, hammer, crow bars, wedges, and pneumatic breaking equipment. The mere fact that Contractor resorts to blasting for reasons of his own, shall not qualify for classification under ‘hard rock’.

This shall also include excavation in macadam and tarred road and pavements. This shall also include rock boulders not longer than 1 meter in any direction and not more than 500 mm in any one of the other two directions. Masonry to be dismantled will also be measured under this item.

D.1.7.2.3 Hard Rock

This shall include all rock occurring in large continuous masses which cannot be removed except by blasting for loosening it. Harder varieties of rock with or without veins and secondary minerals which, in the opinion of Engineer require blasting shall be considered as hard rock. Boulders of rock occurring in such sizes and not classified under (a) and (b) above shall also be classified as hard rock. Concrete work both reinforced and unreinforced to be dismantled will be measured under this item, unless a separate provision is made in the Schedule of Quantities.

D.1.8 EXCAVATION

D.1.8.1 All excavation work shall be carried out by mechanical equipment’s unless, in the opinion of Engineer, the work involved and time schedule permit manual work.

- D.1.8.2 Excavation for permanent work shall be taken out of such widths, lengths, depths and profiles as are shown on the drawings or such other lines and grades as may be specified by Engineer. Rough excavation shall be carried out to a depth 150 mm above the final level. The balance shall be excavated with special care. Soft pockets shall be removed ever below the final level and extra excavation filled up a directed by Engineer. The final excavation if so instructed by Engineer, should be carried out just prior to laying the mud-mat.
- D.1.8.3 Contractor may, for facility of work or similar other reasons, excavate, and also backfill later, if so approved by Engineer, at his own cost outside the lines shown on the drawings or directed by Engineer. Should any excavation be taken below the specified elevations, Contractor shall fill it up, with concrete of the same class as in the foundation resting thereon, upto the required elevation. No extra shall be claimed by Contractor on this account.
- D.1.8.4 All excavation shall be done to the minimum dimensions as required for safety and working facility. Prior approval of Engineer shall be obtained by Contractor in each individual case, for the method he proposes to adopt for the excavation, including dimensions, side slopes, dewatering, disposal etc. This approval, however, shall not in any way relieve Contractor of his responsibility for any consequent loss or damage. The excavation must be carried out in the most expeditious and efficient manner. Side slopes shall be as steep as will stand safely for the actual soil conditions encountered. Every precaution shall be taken to prevent slips. Should slips occur, the slipped material shall be removed and the slope dressed to a modified stable slope. Removal of the slipped earth will not be paid for if the slips are due to the negligence of Contractor.
- D.1.8.5 Excavation shall be carried out with such tools, tackles and equipment as described here in before. Blasting or other methods may be resorted to in the case of hard rock; however not without the specific permission of Engineer.
- D.1.8.6 Engineer may also direct that in some extreme case, the rock may be excavated by heating and sudden quenching for splitting the rock. Fire-wood shall be used for burning and payment shall be made for such work as called for in the schedule of quantities.

D.1.9 STRIPPING LOOSE ROCK

- D.1.9.1 All loose boulders, semi detached rocks (along with earthy stuff which might move therewith) not directly in the excavation but so close to the area to be excavated as to be liable, in the opinion of Engineer, to fall or otherwise endanger the workmen, equipment, or the work, etc. shall be stripped off and removed away from the area of the excavation. The method used shall be such as not to shatter, or render unstable or unsafe the portion which was originally sound and safe.
- D.1.9.2 Any material not requiring removal as contemplated in the work, but which, in the opinion of Engineer, is likely to become loose or unstable later, shall also be promptly and satisfactorily removed as directed by Engineer. The cost of such stripping will be paid for at the unit rates accepted for the class of materials in question.

D.1.10 FILL, BACK FILLING AND SITE GRADING

D.1.10.1 General

- D.1.10.1.1 All fill material will be subject to Engineer's approval. If any material is rejected by Engineer, contractor shall remove the same forthwith from the site at no extra cost to the owner. Surplus fill material shall be deposited / disposed off as directed by Engineer after the fill work is completed within a radius of 5 Km.
- D.1.10.1.2 No earth fill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with as directed by Engineer.

D.1.10.2 Material

- D.1.10.2.1 To the extent available, selected surplus soils from excavated materials shall be used as backfill. Fill material shall be free from clods, salts, sulphates, organic or other foreign material. All clods of earth shall be broken or removed. Where excavated material is mostly rock, the boulders shall be broken into pieces not larger than 150 mm size, mixed with properly graded fine material consisting of murrum or earth fill up the voids and the mixture used for filling.
- D.1.10.3 If any selected fill material is required to be borrowed, Contractor shall make arrangements for bringing such material from outside borrow pits. The material and source shall be subject to prior approval of Engineer. The approved borrow pit area shall be cleared of all bushes, roots of trees, plants, rubbish etc, top soil containing salts / sulphate and other foreign material shall be removed. The materials so removed shall be burnt or disposed off as directed by Engineer. Contractor shall make necessary access to borrow areas and maintain the same, if such access road does not exist, at his cost.

D.1.10.4 Filling in pits and trenches around foundations of structures, walls etc.

- D.1.10.4.1 As soon as the work in foundations has been accepted and measured, the spaces around the foundations, structures, pits, trenches etc. shall be cleaned of all debris, and filled with earth in layers not exceeding 20 cm, each layer being watered, rammed and properly consolidated, before the succeeding one is laid. Each layer shall be consolidated to the satisfaction of Engineer. Earth shall be rammed with approved mechanical compaction machines if instructed. Usually no manual compaction shall be allowed unless Engineer is satisfied that in some cases manual compaction by tampers cannot be avoided. The final backfill surface shall be trimmed and levelled to proper profile as directed by Engineer or indicated on the drawing. The filling with available excavated earth (excluding rock) in foundation will be paid in the item of this tender specified elsewhere.

D.1.10.5 Plinth filling

- D.1.10.5.1 Plinth filling shall be carried out with approved material such as murrum or sand as described herein before in layers not exceeding 20 cm, watered and compacted with mechanical compaction machines. The material murrum or sand will be brought from approved quarry with a lead as specified in the items. If required engineer may however permit manual compaction by hand tampers in case he is satisfied that mechanical compaction is not possible. When filling reaches the finished level, the surface shall be flooded with water, unless otherwise directed for atleast 24 hours, allowed to dry and then the surface again compacted as specified above settlements at a later stage. The finished level of the filling shall be trimmed to the level / slope specified.

D.1.10.5.2 Where specified in the schedule of works, compaction of the plinth fill shall be carried out by roller in case of compaction of granular materials such as sands and gravel, vibratory rollers shall be used. A smaller weight roller may be used only if permitted by Engineer. As rolling proceeds water sprinkling shall be done to assist consolidation. Water shall not be sprinkled in case of sandy fill.

D.1.10.5.3 The thickness of each unconsolidated fill layer can in this case be up to a maximum of 200 mm. Engineer will determine the thickness of the layers in which fill has to be consolidated depending on the fill material and equipment used. Rolling shall commence from the outer edge and progress towards the centre and continue until compaction is to the satisfaction of Engineer, but in no case less than 10 passes of the roller will be accepted for each layer. The compacted surface shall be properly shaped, trimmed and consolidated to an even and uniform gradient. All soft spots shall be excavated and filled and consolidated. At some locations / areas it may not be possible to use rollers because of space restrictions etc. Contractor shall then be permitted to use pneumatic tampers, rammers etc. and he shall ensure proper compaction.

D.1.10.6 Sand filling in plinth and other places

D.1.10.6.1 At places backfilling shall be carried out with local sand if directed by Engineer. The sand used shall be clean, medium grained and free from impurities. The filled in sand shall be kept flooded with water for 24 hours to ensure maximum consolidation. Any temporary work required to contain sand under flooded condition shall be to contractor's account. The surface of the consolidated sand shall be dressed to required level or slope. Construction of floor or other structures on sand fill shall not be started until Engineer has inspected and approved the fill.

D.1.10.7 Filling in Trenches

D.1.10.7.1 Filling in trenches for pipes and drains shall be commenced as soon as the joints of pipes and drains have been tested and passed. The backfilling material shall be properly consolidated by watering and ramming, taking due care that no damage is caused to the pipes.

D.1.10.7.2 Where the trenches are excavated in soil, the filling from the bottom of the trench to the level of the centerline of the pipe shall be done by hand compaction with selected approved earth in layers not exceeding 8 cm; backfilling above the level of the centerline of the pipe shall also be done with selected earth by hand compaction or other approved means in layers not exceeding 20 cm.

D.1.10.7.3 In case of excavation of trenches in rock, the filling upto a level 30 cm above the top of the pipe shall be done with fine materials, such as earth, murrum etc. The filling up to the level of the centerline of the pipe shall be done by hand compaction in layers not exceeding 20 cm. Also the filling above the centerline of the pipe shall be done by hand compaction or approved means in layers not exceeding 20 cm. The filling from a level 30 cm. above the top of the trench shall be done by hand or other approved mechanical methods with broken rock filling of size not exceeding 20 cm mixed with fine material as available to fill up the voids.

D.1.10.7.4 Filling of the trenches shall be carried simultaneously on both sides of the pipe to avoid unequal pressure on the pipe.

D.1.11 GENERAL SITE GRADING

D.1.11.1 Site grading shall be carried out as indicated in the drawings and as directed by Engineer. Excavation shall be carried out as specified in the specification. Filling and compaction shall be carried out as specified under Clause 10.0 and elsewhere unless otherwise indicated below.

D.1.11.2 If no compaction is called for, the fill may be deposited to the full height in one operation and levelled. If the fill has to be compacted, it shall be placed in layers not exceeding 200 mm and levelled uniformly and compacted as indicated in Clause 10.0 before the next layer is deposited.

D.1.11.3 To ensure that the fill has been compacted as specified, field and laboratory tests shall be carried out by Contractor at his cost.

D.1.11.4 Field compaction test shall be carried out at different stages of filling and also after the entire height has been completed. This shall hold good for embankments as well.

D.1.11.5 Contractor shall protect the earth fill from being washed away by rain or damaged in any other way. Should any slip occur, Contractor shall remove the affected material and make good the slip at his cost.

D.1.11.6 The fill shall be carried out to such dimensions and levels as indicated on the drawings after the stipulated compaction. The fill will be considered as incomplete if the desired compaction has not been obtained.

D.1.11.7 If specifically permitted by Engineer, compaction can be obtained by allowing loaded trucks conveying fill or other material to ply over the fill area. Even if such a method is permitted, it will be for contractor to demonstrate that the desired / specified compaction has been obtained. In order that the fill may be reasonably uniform throughout, the material should be dumped in place in approximately uniform layers. Traffic over the fill shall then be so routed to compact the area uniformly throughout.

D.1.11.8 If so specified, the rock as obtained from excavation may be used for filling and levelling to indicate grades without further breaking. In such an event, filling layers not exceeding 50 cms approximately. After rock filling the void in the rocks shall be filled with finer materials such as earth, broken stone etc. and the area flooded so that the finer materials fill up the voids. Care shall be taken to ensure that the finer fill material does not get washed out. Over the layer so filled, a 100 mm thick mixed layer of broken materials and earth shall be laid and consolidation carried out by a 12 tonne roller. No less than twelve passes of the roller shall be accepted before subsequent similar operations are taken up.

D.1.12 FILL DENSITY

D.1.12.1 The compaction, only where so called for, in the schedule of quantities / items shall comply with the specified (Standard Proctor / modified Proctor) density at moisture content differing not more than 4 percent from the optimum moisture content. Contractor

shall demonstrate adequately at his cost, by field and laboratory tests that the specified density has been obtained.

D.1.13 LEAD

- D.1.13.1 Lead for deposition / disposal of excavated material, shall be as specified in the respective item of work. For the purpose of measurement of lead, the area to be excavated or filled or area on which excavated material is to be deposited / disposed off shall be divided into suitable blocks and for each of the blocks, the distance between centerlines shall be taken as the lead which shall be measured by the shortest straight line route taken by Contractor. No extra compensation is admissible on the grounds that the lead including that for borrowed material had to be transported over marshy or 'katcha' land / route.

D.1.14 MEASUREMENT AND PAYMENT

- D.1.14.1 All excavation shall be measured net. Dimensions for purpose of payment shall be reckoned on the horizontal area of the excavation at the base for foundations of the walls, columns, footings, tanks, rafts or other foundations / structures to be built, multiplied by the mean depth from the surface of the ground in accordance with the drawings. Contractor may make such allowance in his rates to provide for excavation in side slopes keeping in mind the nature of the soil and safety of excavation. Reasonable working space, beyond concrete dimensions and shuttering where considered necessary in the opinion of Engineer will be allowed in excavation and considered for payment. However, if concreting is proposed against the excavated sides, no such over – excavation will be permitted. In such cases over-excavation shall be made good by Contractor with concrete of the same class as in the foundations at his cost.
- D.1.14.2 Unless otherwise specified, the unit rates quoted for excavation in different types of material shall also account for a basic lead of 50 meters for disposal as specified or directed. Only leads beyond the basic lead of 50 meters will be considered as extra lead and paid for at the rates quoted in the schedules.
- D.1.14.3 Backfilling as per specifications the sides of foundations of columns, footings, structures, walls, tanks, rafts, trenches etc. with excavated material will not be paid for separately. It shall be clearly understood that the rate quoted for excavation including backfilling shall include stacking of excavated material as directed, excavation / packing of selected stacked material, conveying it to the place of final backfill, compensation etc. as specified. As a rule material to be backfield shall stacked temporarily within the basic lead of 50 meters unless otherwise directed by the Engineer. If Engineer directs / permits a lead of over 90 meters for such material, the conveyance of the material for the extra distance over the basic lead of 50 meters for backfilling will be paid for.
- D.1.14.4 Payment for fill inside trenches, plinth of similar filling with selected excavated material will be made for only compaction as specified / directed. Cost of all other operations shall be deemed to have been covered in the rate quoted for excavation. Payment for this work will be made based on measurement of trench dimensions filled. The plinth ground levels shall be surveyed before hand for this purpose. If no compaction is specified / desired such filling will not be separately paid for. In such an event, the fill shall be levelled / finished to the profile as directed at no extra cost.

- D.1.14.5 Backfilling with borrowed earth will be paid for at rates quoted, if any. The quoted rate shall include all operations such as clearing, excavation, lead and transport, fill, compaction etc. as specified. Actual quantity of consolidated filling or actual quantity or excavation in the borrow pits (less such top soil which has been excavated and not used for filling) whichever is less shall be measured and paid for in cubic meters. The lead, lift etc. shall be as indicated in the schedule of quantities.
- D.1.14.6 Actual quantities of consolidated sand filling shall be measured and paid in cubic meters.

D-2: TIMBER SHORING

SECTION: D-2

D.2.1 SCOPE

- D.2.1.1 This specification covers the general requirements of timber shoring for excavation of trenches, pits, open excavations etc.

D.2.2 GENERAL

- D.2.2.1 Close timbering shall be done by completely covering the sides of the trenches and pits generally with short, upright members called 'polling boards'. These shall be of minimum 25 cm x 4 cm sections or as directed by Engineer. The boards shall generally be placed in position vertically side by side without any gap on each side of the excavation and shall be secured by horizontal walings of strong wood at maximum 1.2 meters spacing, strutted with ballies or as directed by Engineer. The length of the ballies struts shall depend on the width of the trench or pit. If the soil is very soft and loose, the boards shall be placed horizontally against each side of the excavation and supported by vertical walings, which in turn shall be suitably strutted. The lowest boards supporting the sides shall be taken into the ground and no portion of the vertical side of the trench or pit shall remain exposed, so as to render the earth liable to slip out.
- D.2.2.2 Timber shoring shall be 'close' or 'open' type, depending on the nature of soil and the depth of pit or trench. The type of timbering shall be as approved by Engineer. It shall be the responsibility of contractor to take all necessary steps to prevent the sides of excavations, trenches, pits etc. from collapsing.
- D.2.2.3 Timber shoring may be required to keep the sides of excavations vertical to ensure safety of adjoining structures or to limit the slope of excavations, or due to space restrictions or for other reasons. Such shoring shall be carried out, except in an emergency, only under instructions from Engineer.
- D.2.2.4 The withdrawal of the timber shall be done very carefully to prevent the collapse of the pit or trench. It shall be started at one end and proceeded systematically to the other end. Concrete or masonry shall not be damaged during the removal of the timber. No claim shall be entertained for any timber which cannot be withdrawn and is lost or buried.
- D.2.2.5 In the case of open timbering, the entire surface of the side of trench or pit is not required to be covered. The vertical boards of minimum 25 cm x 4 cm sections shall be spaced sufficiently apart to leave unsupported strips of maximum 50 cm average width. The detailed arrangement, sizes of the timber and the spacing shall be subject to the approval of engineer. In all other respects, specification for close timbering shall apply to open timbering.
- D.2.2.6 In case of large pits and open excavations, where shoring is required for securing safety of adjoining structures or for any other reasons and where the planking for sides of excavations / pits cannot be strutted against, suitable inclined struts supported on the excavated bed shall be provided. Load from such struts shall be suitably distributed on the bed to ensure no yielding of the strut. If, however, Engineer directs any timbering to be

left-in, keeping in mind the type of construction or any other factor, contract shall be paid for at the scheduled item rate for such left-in timbering.

D.2.3 MEASUREMENT

D.2.3 Rate of the item excavation includes timber shoring, strutting and planking hence no extra payment will be made for this. All planks, boards, walings, verticals, struts, props and all other materials required for shoring and subsequent safe dismantling and removal shall be included in the quoted unit rates of item of excavation.

D-3: DEWATERING

SECTION: D-3

D.3.1 SCOPE

- D.3.1.1 This specification covers the general requirements of dewatering excavations in general.

D.3.2 GENERAL

- D.3.2.1 All excavations shall be kept free of water. Grading in the vicinity of excavations shall be controlled to prevent surface water running into excavated areas. Contractor shall remove by pumping or other means approved by Engineer any water inclusive of rain water and subsoil water accumulated in excavation and keep all excavations dewatered until the foundation work is completed and backfilled. Sumps made for dewatering must be kept clear of the excavations / trenches required for further work. Method of pumping shall be approved by Engineer but any case, the pumping arrangement shall be such that there shall be no movement of subsoil or blowing in due to differential head of water during pumping. Pumping arrangements shall be adequate to ensure no delays in construction.
- D.3.2.2 Contractor shall visit the site and carry out necessary test to work out the cost. AMC will not be responsible for subsoil survey or any data given in tender document. Contractor is deemed to have inspected and examined the site and its surroundings and to have satisfied himself to the nature of site before submitting his tender.
- D.3.2.3 When there is a continuous inflow of water and quantum of water to be handled is considered in the opinion of Engineer, as large, well point system – single stage or multistage, shall be adopted. Contractor shall submit to Engineer his scheme of well point system including the stages, the spacing, number and diameter of well points, heads etc. and the number, capacity and location of pumps of approval.

D.3.3 MEASUREMENT

Dewatering is deemed to have been included in the unit rates quoted for excavation. No extra payment will be made against dewatering and excavation in wet soil condition.

D-4: RAIN WATER DRAINAGE IN EXCAVATED AREA

SECTION: D-4

D.4.1 SCOPE

D.4.1.1 This section covers the drainage of rain water in excavated areas.

D.4.2 GENERAL

D.4.2.1 Grading in the vicinity of excavation shall be such as to exclude rain / surface water draining into excavated areas. Excavation shall be kept clean of rain and such water as the Contractor may be using for his work by suitably pumping out the same at no extra cost to the owner. The scheme for pumping and discharge of such water shall be approved by the Engineer.

D.4.2.2 Carrying out rain water drainage in excavated area is included in the item of excavation. No extra payment will be made for this.

D-5: SITE FILLING

SECTION: D-5

D.5.1 SCOPE

- D.5.1.1 Apart from any other work / purpose for which this specification may be made applicable by Engineer, this shall generally govern work involving filling site / plant over the entire area / most of the area to raise the general grade level to the desired elevation. This work shall be carried out as per applicable clauses “Earthwork in Grading, Excavation and Backfilling” particularly clauses 10 & 11.

D.5.2 FILL MATERIAL

D.5.2.1 General

- D.5.2.1.1 All fill material whether such material is brought from outside borrow areas or excavation within the site, will be subject to Engineer’s approval. Notwithstanding any approval given to the fill material or borrow areas from which fill material is proposed to be brought, Engineer / Owner reserves the right to reject such material which in his opinion either does not meet the specification requirements or is unsuitable for the purpose for which it is intended.

D.5.2.2 Borrow Areas

- D.5.2.2.1 It shall be Contractor’s responsibility to locate suitable borrow areas for borrowing fill material. Such areas will be inspected by Engineer and approved before Contractor makes arrangements to borrow the fill material. The top soil which may contain vegetation, rubbish, slush etc. shall not be used. If demanded by Engineer. Contractor shall arrange to have trial pits of specified dimensions and numbers dug at locations specified, for Engineer to examine the nature and type of material likely to be obtained from the borrow area.

D.5.2.3 Lead, Lift and Transportation

- D.5.2.3.1 Unless separately provided, for, all lead, lift and transportation required for bringing in the fill material from borrow areas or from excavation from within the site shall be included in the Contractor’s quote unit rates.

D.5.2.4 Quality

- D.5.2.4.1 The borrowed soil shall be generally granular, and non-cohesive. It shall consist of sand, silty sand, murrum, ordinary soil, gravel and shingle. Dredged material, free from clayey deposit, will be accepted. Fill material shall also be free from sulphates, salts, organic, foreign and other harmful or objectionable materials. Any material rejected by Engineer shall be removed from the site immediately.

D.5.3 ACCESS ROAD

- D.5.3.1 Roads, whether of temporary or other nature, required to be constructed for access and for movement of man, materials. Equipments, transport vehicles, vehicles carrying fill

material etc. to or over borrow areas and/or to or over areas on which fill has to be deposited shall be constructed by Contractor at his cost. Such costs shall be deemed to have been included in the unit rates quoted by Contractor. Such access roads shall be maintained in good condition during all seasons to ensure completion of work according to time schedule.

D.5.4 CLEARING

D.5.4.1 Site clearing before filling shall be carried out as specified in the enclosed specification. Earthwork in Grading, Excavation and backfilling.

D.5.5 FILLING

D.5.5.1 Backfill

D.5.5.1.1 Backfill shall be deposited to bring the grade level to desired elevation after compaction of fill.

D.5.5.1.2 Back fill shall be compacted, where so specified, by 12 tons rollers as indicated in Clause D.5.5.2.3 below. The fill material shall be compacted to the specified density, where so specified.

D.5.5.1.3 If the density of fill use of rollers for compaction is not specified. Contractor shall ensure necessary compaction by the passage of trucks, carrying the fill material over the deposited fill in such a way that the entire fill area is covered. These will reasonably compact the sand fill will be accepted by Engineer. However, Contractor shall ensure that every layer is thus compacted before the succeeding layers are deposited. Each layer shall not exceed 200 mm in thickness.

D.5.5.1.4 Compaction of back fill by flooring the area shall be carried out where so specified. In this case, Contractor should ensure that the fill material is not washed away. This work shall be carried out as directed by Engineer.

D.5.5.2 Soil Fill

D.5.5.2.1 Approval soil fill consisting of ordinary soil, murrum, soil containing gravel, shingle etc. shall be deposited in layers not exceeding 200 mm. Contractor should ensure that all clods of earth are broken down to a size not larger than 100 mm.

D.5.5.2.2 Where density of fill or use of rollers is not specified, the fill shall be carried out as specified in Clause D.5.5.1.3 above.

D.5.5.2.3 Where the fill material has to be compacted by use of rollers procedure as specified in Clause D.1.10.5.2 of specification for “Earthwork in Grading, Excavation and Backfilling”.

D.5.5.2.4 Where specified, the required density of fill shall be obtained by proper compaction.

D.5.6 MEASUREMENT

D.5.6.1 This item of site filling is to be measured in Cu.M. of work done and payment shall be made on basis of Cu.M.

D-6: CONCRETE WORKS

SECTION: D-6

D.6.1 SCOPE

D.6.1.1 This Specification covers the general requirements for concrete using on-site production facilities including requirements in regard to the quality, handling, storage of ingredients, proportioning, batching, mixing, transporting, placing, curing, protecting, repairing, finishing and testing of concrete; form work; requirements in regard to the quality, storage, bending and fixing of reinforcement; grouting as well as mode of measurement and payment for complete works.

D.6.1.2 It shall be very clearly understood that the specifications given herein are brief and do not cover minute details. However, all work shall have to be carried out in accordance with the relevant standards and codes of practices or in their absence in accordance with the best accepted current engineering practices or as directed by Engineer from time to time. The decision of Engineer as regards the specification to be adopted and their interpretation and the mode of execution of work shall be final and binding on Contractor and no claim whatsoever will be entertained on this account.

D.6.2 APPLICABLE CODES AND SPECIFICATIONS

D.6.2.1 The following specifications, standards and codes, including all official amendments / revisions and other specifications and codes referred to therein, should be considered a part of this specification. In all cases the latest issue / edition / revision shall apply. In case of discrepancy between this specification and those referred to herein below or other specifications forming a part of this bid document, this specification shall govern.

D.6.2.2 Code for Materials

1. IS : 269 - Specification for 33 grade ordinary Portland cement
2. IS : 455 - Specification for Portland slag cement
3. IS : 1489 - Specification for Portland pozzolona cement
(Part 1 and 2)
4. IS : 8112 - Specification for 43 grade ordinary Portland cement.
5. IS : 12330 - Specification for sulphate resisting Portland cement
6. IS : 383 - Specification for coarse and fine aggregates from natural sources for concrete.
7. IS : 432 - Specification for mild steel and medium tensile
(Part 1 and 2) steel bars and hard drawn steel wires for concrete reinforcement.
8. IS : 1786 - Specification for high strength deformed steel bars and wires for concrete reinforcement.
9. IS : 1566 - Specification for hard drawn steel wire fabric for concrete reinforcement.
10. IS : 9103 - Specification for admixtures for concrete.
11. IS : 2645 - Specification for integral cement water proofing compounds.
12. IS : 4990 - Specification for plywood for concrete shuttering

- work.
13. IS : 12269 - Specification for 53 grade ordinary Portland cement.

D.6.2.3 Code for Material Testing

1. IS : 4031 - Methods of physical tests for hydraulic cement.
(Parts 1 to 15)
2. IS : 4032 - Methods of chemical analysis of hydraulic cement.
3. IS : 650 - Specifications for standard sand for testing of cement.
4. IS : 2430 - Methods for sampling of aggregates for concrete.
5. IS : 2386 - Methods of test for aggregates for concrete.
(Parts 1 to 8)
6. IS : 3025 - Methods of sampling and test (physical and chemical) water used in industry.
7. IS : 6925 - Methods of test for determination of water soluble chlorides in concrete admixtures.

D.6.2.4 Code for Materials Storage

1. IS : 4082 - Recommendations on stacking and storing of construction materials at site.

D.6.2.5 Code for Concrete Mix Design

1. IS : 10262 - Recommended guidelines for concrete mix design.
2. SP : 23 - Handbook on Concrete Mixes.
(S&T)

D.6.2.6 Code for Concrete Testing

1. IS : 1199 - Method of sampling and analysis of concrete.
2. IS : 516 - Method of test for strength of concrete
3. IS : 9013 - Method of making, curing and determining compressive strength of accelerated cured concrete test specimens.
4. IS : 8142 - Method of test for determining setting time of concrete by penetration resistance.
5. IS : 9284 - Method of test for abrasion resistance of concrete.
6. IS : 2770 - Methods of testing bond in reinforced concrete.

D.6.2.7 Code for Equipment

1. IS : 1791 - Specification for batch type concrete mixers.
2. IS : 2438 - Specification for roller pan mixer.
3. IS : 4925 - Specification for concrete batching and mixing plant.
4. IS : 5892 - Specification for concrete transit mixer and agitator.
5. IS : 7242 - Specification for concrete spreaders.

6. IS : 2505 - General Requirements for concrete Vibrators: Immersion type.
7. IS : 2506 - General Requirements for screed board concrete vibrators.
8. IS : 2514 - Specification for concrete vibrating tables.
9. IS : 3366 - Specification for pan vibrators.
10. IS : 4656 - Specification for form vibrators for concrete.
11. IS : 11993 - Code of practice for use of screed board concrete vibrators.
12. IS : 7251 - Specification for concrete finishers.
13. IS : 2722 - Specification for portable swing weigh batchers for concrete (single and double bucket type).
14. IS : 2750 - Specification for steel scaffoldings.

D.6.2.8 Codes of Practice

1. IS : 456 - Code of practice for plain and reinforced concrete.
2. IS : 457 - Code of practice for general construction of plain and reinforced concrete for dams and other massive structures.
3. IS : 3370 - Code of practice for concrete structures for storage of liquids.
(Parts 1 to)
4. IS : 3935 - Code of practice for composite construction.
5. IS : 2204 - Code of practice for construction of reinforced concrete shell roof.
6. IS : 2210 - Criteria for the design of reinforced concrete shell structures and folded plates.
7. IS : 2502 - Code of practice for bending and fixing of bars for concrete reinforcement.
8. IS : 5525 - Recommendation for detailing of reinforcement in reinforced concrete works.
9. IS : 2751 - Code of practice for welding of mild steel plain and deformed bars used for reinforced concrete construction.
10. IS : 9417 - Specification for welding cold worked bars for reinforced concrete construction.
11. IS : 3558 - Code of practice for use of immersion vibrators for consolidating concrete.
12. IS : 3414 - Code of practice for design and installation of joints in buildings.
13. IS : 4326 - Code of practice for earthquake resistant design and construction of building.
14. IS : 4014 - Code of practice for steel tubular scaffolding.
(Part 1 a
15. IS : 2571 - Code of practice for laying in-situ cement concrete flooring.
16. IS : 7861 - Code of practice for extreme weather concreting.
(Part – 1) - Recommended practice for hot weather concreting.
(Part – 2) - Recommended practice for cold weather concreting.

D.6.2.9 Code for Construction safety

1. IS : 3696 - Safety code for scaffolds and ladders.
(Parts I and III)
2. IS : 7969 - Safety code for handling and storage of building materials.
3. IS : 8989 - Safety code for erection of concrete framed structures.

D.6.2.10 Code for Measurement

1. IS : 1200 - Method of measurement of building and engineering works.
(Part 1 to 28)
2. IS : 3385 - Code of practice for measurement of Civil Engineering works.

D.6.3 GENERAL

D.6.3.1 Engineer shall have the right at all times to inspect all operations including the sources of materials, procurement, layout and storage of materials, the concrete batching and mixing equipment, and the quality control system. Such an inspection shall be arranged and Engineer's approval obtained, prior to starting of concrete work. This shall, however, not relieve Contractor of any of his responsibilities. All materials which does not conform to this specification shall be rejected.

D.6.3.2 Materials should be selected so that they can satisfy the design requirements of strength, serviceability, safety, durability and finish with due regards to the functional requirements and the environmental conditions to which the structure will be subjected. Materials complying with codes / standards shall generally be used, other materials may be used after approval of the Engineer and after establishing their performance suitability based on previous data, experience or tests.

D.6.4 MATERIALS

D.6.4.1 Cement

D.6.4.1.1 Unless otherwise specified or called for by the Engineer, cement shall be **Ordinary Portland Cement conforming** to IS specified above.

D.6.4.1.2 Where Portland pozzolona or slag cement are used, it shall be ensured that consistency of quality is maintained, there will be no adverse interactions between the materials and the finish specified is not marred.

D.6.4.1.3 Only one type of cement shall be used in any one mix. The source of supply, type or brand of cement within the same structure or portion thereof shall not be changed without approval from Engineer.

D.6.4.1.4 Cement which is not used within 90 days from its date of manufacture shall be tested at a laboratory approved by Engineer and until the results of such tests are found satisfactory, it shall not be used in any work.

D.6.4.2 Aggregates (General)

D.6.4.2.1 General

- D.6.4.2.1.1 “Aggregate” in general designates both fine and coarse inert materials used in the manufacture of concrete (vide BIS 456 & BIS 383) and conforming to tests as per BIS 2386 (Part I to VI).
- D.6.4.2.1.2 “Coarse Aggregate” is aggregate most of which is retained when passed through on 4.75 mm BIS sieve.
- D.6.4.2.1.3 All fine and coarse aggregates proposed for use in the works shall be subject to the Engineer-in-Charge’s approval and after specific materials have been accepted, the source of supply of such materials shall not be changed without prior approval of the Engineer-in-charge.
- D.6.4.2.1.4 Aggregates shall consist of natural sand, stone (crushed or uncrushed) and gravel from a source known to produce satisfactory aggregate for concrete and shall be chemically inert, non-flaky, strong, hard, durable against weathering, or limited porosity and free from deleterious materials that may cause corrosion of the reinforcement or may impair the strength and or durability of concrete. The grading of aggregates shall be such as to produce a dense concrete of specified strength and consistency that will work readily into position without segregation and shall be based on the “mix design” and preliminary tests on concrete specified later. The aggregates shall be brought from the source as mentioned in Volume–I Clause C.1.39.

D.6.4.2.2 Sampling and testing

- D.6.4.2.2.1 Samples of the aggregates for mixed design and determination of suitability shall be taken under the supervision of the Engineer-in-charge and delivered to the laboratory, well in advance of the scheduled placing of concrete. Records of tests, which have been made on proposed aggregates and on concrete made from this source of aggregates shall be furnished to Engineer-in-charge in advance of the work, for use in determining aggregate suitability. The costs of all such tests, sampling etc. shall be borne by the contractor.

D.6.4.2.3 Storage of aggregates

- D.6.4.2.3.1 All coarse and fine aggregates shall be stacked separately in stock piles in the material yard near the work site in bins properly constructed to avoid inter mixing of different aggregates. Contamination with foreign material and earth during storage and while heaping the materials shall be avoided. The aggregates must be of specified quality not only at the time of receiving at site but more so at the time of loading into mixer. Rakers shall be piled in layers not exceeding 1.20 m in height to prevent coning or segregation. Each layer shall cover the entire area of stock pile before succeeding layers are started. Aggregates that have become segregated shall be rejected.

D.6.4.2.4 Specific Gravity

- D.6.4.2.4.1 Aggregates having a specific gravity below 2.4 (saturated surface dry basis) shall not be used.

D.6.4.3 Fine Aggregate

D.6.4.3.1 Fine aggregate shall consist of natural or crushed sand conforming to IS 383 conforming to tests as per IS 2386 part I to IV. The sand shall be clean, sharp, hard, strong and durable and shall be free from dust, vegetable substances, adherent coating, clay, alkali, organic matter, mica, salt or other deleterious substances, which can be injurious to the setting qualities / strength/ durability of concrete.

D.6.4.3.2 Screening and Washing: Sand shall be prepared for use by such screening or washing, or both, as necessary, to remove all objectionable foreign matter while separating the sand grains to the required size fraction.

D.6.4.3.3 Foreign Material limitations: The percentage deleterious substances in sand delivered to the mixer shall not exceeding the following:

Sr. No.	Foreign Material	Percentage by weight	
		Uncrushed	Crushed
1	Material finer than 75 micron IS sieve	3.0	15.0
2	Shale	1.0	--
3	Coal and Lignite	1.0	1.0
4	Clay Lumps	1.0	1.0

D.6.4.3.4 Gradation: Unless otherwise directed or approved by the Engineer-in-charge, the grading of sand shall be within the limits indicated hereunder.

IS : Sieve Designation	Grading Zone-I	Grading Zone-II	Grading Zone-III	Grading Zone-IV
10 mm	100	100	100	100
4.75 mm	99 – 100	90 – 100	90 – 100	95 – 100
2.36 mm	60 – 95	75 – 100	85 – 100	95 – 100
1.18 mm	30 – 70	55 – 90	75 – 100	90 – 100
600 microns	15 – 34	35 – 59	60 – 79	80 – 100
300 microns	5 – 20	8 – 30	12 – 40	15 – 50
150 microns	0 – 10	0 – 10	0 – 10	0 – 15

D.6.4.3.4.1 Where the grading falls outside the limits of any particular grading zone of sieves, other than 600 microns IS sieve, by total amount not exceeding 5%, it shall be regarded as falling within that grading zone. This tolerance shall not be applied to percentage passing the 600 micron IS sieve or to percentage passing any other sieve on the coarser limit of grading zone I or the finer limit of grading zone IV. Fine aggregates conforming to grading zone IV shall not be used. Mix designs and preliminary tests shall show its suitability for producing concrete of specified strength and workability.

D.6.4.3.5 Fineness Modulus

The sand shall have a fineness modulus of not less than 2.2 or more than 4.2. The fineness modulus is determined by adding the cumulative percentages retained on the following IS sieve sizes (4.75 mm, 2.35 mm, 1.18 mm, 600 microns and 150 microns) and dividing the sum by 100.

D.6.4.4 Coarse Aggregate

D.6.4.4.1 Coarse aggregate for concrete, except as noted above, shall conform to IS 383 and IS 2386. This shall consist of crushed stone and shall be clean and free from elongated, flaky or laminated pieces, adhering coatings, clay lumps, coal residue, clinkers, slag, alkali, mica, organic matter or other deleterious matter.

D.6.4.4.2 Screening and Washing: Crushed rock shall be screened and or washed for the removal of dirt or dust coating, if so requested by the Engineer-in-charge.

D.6.4.4.3 Grading

D.6.4.4.3.1 Coarse aggregate shall be either in single size or graded, in both cases the grading shall be within the following limits:

IS Sieve Size (mm)	Percentage passing for single sized Aggregate of normal size					Percentage passing for graded Aggregate of normal size			
	40 mm	20 mm	16 mm	12.5 mm	10 mm	40 mm	20 mm	16 mm	12.5 mm
63	100	--	--	--	--	--	--	--	--
40	85–100	100	--	--	--	95–100	100	--	--
20	0–20	85–100	100	--	--	30–70	95–100	100	100
16	--	--	85–100	100	--	--	--	90–100	--
12.5	--	--	--	85–100	100	--	--	--	90–100
10	0 – 5	0–20	0–30	0–45	85–100	10–35	25–55	30–70	40–85
4.75	--	0–5	0–5	0–10	0–20	0–5	0–10	0–10	0–10
2.36	--	--	--	--	0–5	--	--	--	--

D.6.4.4.3.2 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 within tolerance limits which will not affect adversely the strength and or durability or concrete. The maximum size of coarse aggregate shall be 40 mm for M7.5 and M10 and 20 mm for M15 to M20 concrete, or as directed by the Engineer-in-charge or specified otherwise. The maximum size of coarse aggregate shall be the maximum size specified above but in no case greater than $\frac{1}{4}$ th of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and fill the corners of the form. For plain concrete the maximum size of aggregate shall be of 40 mm. 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 reinforcement whichever is smaller.

D.6.4.4.4 Foreign material limitations

D.6.4.4.4.1 The percentage of deleterious materials in the aggregate delivered to the mixer shall not exceed the following:

Sr. No.	Foreign Material	Percentage by weight	
		Uncrushed	Crushed

1	Material finer than 75 micron IS sieve	3.0	3.0
2	Coal and lignite	1.0	1.0
3	Clay lumps	1.0	1.0
4	Soft fragments	3.0	--

D.6.4.5 Water

D.6.4.5.1 Water used for both mixing and curing shall conform to IS: 456. Potable water is generally satisfactory. Water containing any excess of acid, alkali, sugar or salt shall not be used.

D.6.4.6 Reinforcement

D.6.4.6.1 Reinforcement bars shall conform to IS: 432, IS: 226 or IS: 1786 and the welded wire fabric to IS: 1566 as shown or specified on the drawings.

D.6.4.6.2 All reinforcement shall be clean, free from pitting, oil, grease, paint, and loose mill scales, rust, dirty dust or any other substance that will destroy or reduce bond.

D.6.4.6.3 If permitted by Engineer, welding of reinforcement shall be done in accordance with IS: 2751 or IS: 9417 as applicable.

D.6.4.7 Admixtures

D.6.4.7.1 Accelerating, retarding, water-reducing and air entraining admixtures shall conform to IS: 9103 and integral water proofing admixtures to IS: 2645. Dosage of plasticizer used in concrete work shall be 300 ml/50 kg. of cement. Manufacturer must comply ISO-9002 specifications.

D.6.4.7.2 Admixtures may be used in concrete as per manufacturer's instructions only with the approval of Engineer based upon evidence that with the passage of time neither the compressive strength nor its durability is reduced. An admixture's suitability and effectiveness shall be verified by trial mixes with the other material used in the works. If two or more admixtures are to be used simultaneously in the same concrete mix, their interaction shall be checked and trial mixes done to ensure their compatibility. There should also be no increase in risk of corrosion of the reinforcement or other embedment.

D.6.4.7.3 Calcium chloride shall not be used for accelerating set of the cement for any concrete containing reinforcement or embedded steel parts. When calcium chloride is permitted such as in mass concrete works, it shall be dissolved in water and added to the mixing water by an amount not exceeding 1.5 percent of the weight of the cement in each batch of concrete. The designed concrete mix shall be corrected accordingly.

D.6.4.8 Wastage

D.6.4.8.1 No wastage allowance for cement and steel shall be considered and paid for.

D.6.5 SAMPLES AND TESTS

- D.6.5.1 All materials used for the works shall be tested before use.
- D.6.5.2 Manufacturer's test certificate shall be furnished, for each batch of cement / steel and when directed by Engineer samples shall also be got tested by the Contractor in a laboratory approved by Engineer at no extra cost to Client. However, where material is supplied by Client, all testing charges shall be borne by Client; but transportation of material samples to the laboratory shall have to be done by Contractor at no extra cost.
- D.6.5.3 Sampling and testing shall be as per IS: 2386 under the supervision of Engineer. The cost of all tests, sampling etc. shall be borne by Contractor.
- D.6.5.4 Water to be used shall be tested to comply with requirement of IS: 456.
- D.6.5.5 Contractor shall furnish manufacturer's test certificates and technical literature for the admixture proposed to be used. If directed the admixture shall be got tested and approved laboratory at no extra cost.

D.6.6 STORING OF MATERIALS

- D.6.6.1 All material shall be stored in a manner so as to prevent its deterioration and contamination which would preclude its use in the works. Requirements of IS: 4082 shall be complied with.
- D.6.6.2 Contractor will have to make his own arrangements for the storage of adequate quantity of cement even if cement is supplied by Client. Cost of such rejected cement, where cement is supplied by Client, shall be recovered at issue rate or open market rate whichever is higher. Cement bags shall be stored in dry weatherproof shed with a raised floor, well away from the outer walls and insulated from the floor to avoid moisture from ground. Not more than 15 bags shall be stacked in any tier. Storage arrangement shall be approved by Engineer. Storage under tarpaulins shall not be permitted. Each consignment of cement shall be stored separately and consumed in its order or receipt.
- D.6.6.3 Each size of coarse and fine aggregates shall be stacked separately and shall be protected from leaves and contamination with foreign material. The stacks shall be on hard, clean, free draining bases, draining away from the concrete mixing area.
- D.6.6.4 Contractor shall make his own arrangements for storing water at site in tanks to prevent contamination.
- D.6.6.5 The reinforcement shall be stacked on top of timber sleepers to avoid contact with ground / water. Each type and size shall be stacked separately.

D.6.7 CONCRETE

D.6.7.1 General

Concrete grade shall be as designated on drawings. In concrete grade M15, M20, M25, M30 etc. the number represents the specified characteristic compressive strength of 150 mm cube at 28 days, expressed in N/sq.mm as per IS : 456. Concrete in the works shall be “**Design Mix Concrete**” or “**Normal Mix Concrete**”. All concrete

works of **grade M5, M7.5, M-10 and M15 shall be Nominal** whereas all other grades, M20 and above, shall be **Design Mix Concrete**.

D.6.7.2. (a) Ready mix concrete

Minimum cement consumption shall be as specified in tender document. However, necessary computer print out for consumption of all materials and admixtures if permitted shall be made available as and when required in any frequencies as directed by Engineer –in-charge.

Necessary slump requirements at the pouring places shall be made available with ready mix concrete.

Concrete mix shall be design for 33% higher strength than the grade of concrete specified. The proportions for ingredients chosen shall be such that concrete has adequate workability for condition prevailing on the work in question and can be properly compacted with the means available. Use of cementitious material like Fly ash etc. shall not be permissible.

Except where it can be shown to the satisfaction of the Engineer-in-charge that a supply of properly graded aggregate of uniform quality can be maintained till the completion of work, grading of aggregate should be strictly controlled. The different sizes shall be stocked in separate stock piles. Required quality of material shall be stock-piled several hours, preferably a day, before use. Grading of coarse and fine aggregate shall be checked as frequently as possible, frequency for a given job being determined by the Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the design mix.

The quantity of both cement and aggregate shall be determined by weight. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked.

It is most important to keep the specified water – cement ratio constants and its correct value. To this end, the moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates, IS: 2386 (Part-III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates to allow for the variation in weights of aggregates due to variation in their moisture content.

The special Conditions / Specification regarding RMC are as follows.

The details like locations, capacity, experience, delivery schedule etc. of the RMC agency shall be submitted by the successfully tenderer for prior approval of the undersigned.

The RMC shall be conforming to IS: 4926 with its latest amendments.

All the responsibility of RMC i.e. procurement for all materials, operation of plant and machinery, transit mixers, pumping machineries relevant piping etc. shall be on the account of the contractor.

The AMC shall not be held responsible for any delay / damage / loss due to deployment of RMC for this project.

The octroi for the RMC shall have to be borne by the contractor as per prevailing rates.

RMC process shall be fully automatic and computerized

When a transit mixer is used for transportation of concrete, no extra water should be added to the concrete from elsewhere after initial introduction of mixing water from the batch, except when on arrival at the site of the work, the slump of the concrete is less than that specified: such additional water to bring the mixer under such pressure and direction of flow that requirements for uniformity are met.

Records and certificates: The contractor shall keep from the manufacture batch records of the quantities by mass of all mixing and of the results of all tests. If required by the AMC, the contractor shall furnish certificates, at agreed intervals, giving this information.

The contractor shall supply the following information for guidance of the manufacturer:

The type of cement to be used

Details Specification of aggregates to be used.

Type of admixture to be used. If specified.

Min. acceptable strength

Slump of concrete or compaction factor

Ages at which the test cubes or beams are to be tested and the frequency and number of test to be made.

Any other requirement.

Tolerance: Unless otherwise agreed to between the AMC and the contractor, the concrete shall be deemed to comply with the requirements of this, if these results of testes where applicable lie within the tolerance specified below.

Consistency of workability: The slump average of two tests shall not differ from the specified value by + 10 mm for a specified slump of 75 mm. The compacting factor average of two test shall be within + 0.03 of the value specified. If any other method of determining consistency to be used a suitable tolerance shall be agreed to be between the purchaser and the manufacture. The tests for consistency or workability shall be complete within 15 minutes of the time of receipt of the ready mix concrete at the site.

Aggregate : When tested in accordance with IS 2386 (Part-I) 1963, the quantity of aggregate larger than the max size specified by the purchaser shall not exceed 5% of the qty. of coarse aggregate and all such pass sieve of next higher size.

Note: Ready mix concrete work must be used with consent of Engineer In-Charge.(AMC)

D.6.7.2. (b) Design Mix Concrete

D.6.7.2.1 Mix Design and Testing

D.6.7.2.1.1 For Design Mix Concrete, the mix shall be designed according to IS : 10262 and SP: 23 to provide the grade of concrete having the required workability and characteristics strength not less than appropriate values given in IS : 456. The design mix shall in addition be such that it is cohesive and does not segregate and should result in dense and durable concrete and also capable of giving the finish as specified. For water retaining structures, the mix shall also result in water-tight concrete. The Contractor shall exercise great care while designing the concrete mix and executing the works to achieve the desired result.

D.6.7.2.1.2 Unless otherwise specifically mentioned, the minimum cement content for Design Mix Concrete shall be as given below.

Grade of Concrete	Minimum Cement Content in Kg/Cu.m of concrete
M20	330
M25	365
M30	410

The minimum cement content stipulated above shall be adopted irrespective of whether the Contractor achieves the desired strength with less quantity of cement. The Contractor's quoted rates for concrete shall provide for the above eventually and nothing extra shall become payable to the Contractor in this account. Even in the case where the quantity of cement required is higher than that specified above to achieve desired strength based on an approved mix design, nothing extra shall become payable to the Contractor.

D.6.7.2.1.3 It shall be Contractor's sole responsibility to carry out the mix designs at his own cost. He shall furnish to Engineer at least 30 days before concreting operations, a statement of proportions proposed to be used for the various concrete mixes and the strength results obtained. The strength requirements of the concrete mixes ascertained on 150 mm cubes as per IS: 516 shall comply with the requirements of IS: 456.

Grade of Concrete	Minimum Compressive Strength (N/Sq.mm at 7 days)	Specified Compressive strength (N/Sq.mm at 28 days)
M15	10.0	15.0
M 20	13.5	20.0
M 25	17.0	25.0
M 30	20.0	30.0
M 35	23.5	35.0
M 40	27.0	40.0

D.6.7.2.1.4 A range of slumps, which shall generally be used for various types of construction unless otherwise instructed by the Engineer, is given below:

Structure / Member	Slump in millimeters	
	Maximum	Minimum
Reinforced foundation walls and footings	75	25
Plain footings, caissons and substructure walls	75	25
T.G. and massive compressor foundations	50	25
Slabs, beams and reinforced walls	100	25
Pumps and miscellaneous equipment foundations	75	25
Building columns	100	25
Pavements	50	25
Heavy mass construction	50	25

D.6.7.2.2 Batching and Mixing of Concrete

- D.6.7.2.2.1 Proportions of aggregates and cement, as decided by the concrete mix design, shall be by weight. These proportions shall be maintained during subsequent concrete batching by means of weigh batchers capable of controlling the weights within one percent of the desired value.
- D.6.7.2.2.2 Amount of water added shall be such as to produce dense concrete of required consistency, specified strength and satisfactory workability and shall be so adjusted to account for moisture content in the aggregates. Water cement ratio specified shall be maintained. Each time the work stops, the mixer shall be cleaned out, and while recommencing, the first batch shall have 10% additional cement to allow for sticking in the drum.
- D.6.7.2.2.3 Arrangement should be made by Contractor to have the cubes tested in an approved laboratory or in field at his own expense, with prior consent of Engineer. Sampling and testing of strength and workability of concrete shall be as per **IS: 1199, IS: 516 and IS: 456.**

D.6.7.3 Nominal Mix Concrete

D.6.7.3.1 Mix Design and Testing

- D.6.7.3.1.1 Mix design and preliminary tests are not necessary for Nominal mix Concrete. However works tests shall be carried out as per IS: 456. Proportions for Nominal Mix Concrete and **water / cement ratio may** be adopted as per Table 3 of IS: 456. However it will be Contractor's sole responsibility to adopt appropriate nominal mix proportions to yield the specified strength.

D.6.7.3.2 Batching and Mixing Concrete

- D.6.7.3.2.1 Based on the adopted nominal mixes, aggregates and cement shall be measured by weight.

D.6.8 FORM WORK

- D.6.8.1 Form work shall be all inclusive and shall consist of but not limited to shores, bracings, sides of footings, walls, beams and columns, bottom of slabs etc. including ties, anchors, hangers, inserts, false work, wedges etc.
- D.6.8.2 The design and engineering of the formwork as well as its construction shall be the responsibility of Contractor. However, if so desired by Engineer the drawings and calculations for the design of the formwork shall be submitted to Engineer for approval.
- D.6.8.3 Formwork shall be designed to fulfill the following requirements:
- a) Sufficiently rigid and tight to prevent loss of grout or mortar from the concrete at all stages and appropriate to the methods of placing and compacting.

- b) Made of suitable materials.
- c) Capable of providing concrete of the correct shape and surface finish within the specified tolerance limits.
- d) Capable of withstanding without deflection the worst combination of self weight, reinforcement and concrete weight, all loads and dynamic effects arising from construction and compacting activities, wind and weather forces.
- e) Capable of easily striking without shock, disturbance or damage to the concrete.
- f) Soffit forms capable of imparting a camber if required.
- g) Soffit forms and supports capable of being left in position if required.
- h) Capable of being cleaned and / or coated if necessary immediately prior to casting the concrete; design temporary openings where necessary for these purposes and to facilitate the preparation of construction joints.

- D.6.8.4 The formwork may be of timber, plywood, steel, plastic or concrete depending upon the type of finish specified. Sliding forms and slip form may be used with the approval of Engineer. Timber for formwork shall be well seasoned, free from sap, shakes, loose knots, work holes, warps and other surface defects. Joints between formwork and formwork and between formwork and structures shall be sufficiently tight to prevent loss of slurry from concrete, using seals if necessary.
- D.6.8.5 The faces of formwork coming in contact with concrete shall be cleaned and two coats of approved mould oil applied before fixing reinforcement. All rubbish, particularly chippings, shavings, sawdust, wire pieces dust etc. shall be removed from the interior of the forms before the concrete is placed. Where directed, cleaning of forms shall be done by blasting with a jet of compressed air at no extra cost.
- D.6.8.6 Forms intended for reuse shall be treated with care. Forms that have deteriorated shall not be used. Before reuse, all forms shall be thoroughly scraped, cleaned, nails removed, holes suitably plugged, joints repaired and warped lumber replaced to the satisfaction of Engineer. The Contractor shall equip himself with enough shuttering to allow for wastage so as to complete the job in time.
- D.6.8.7 Permanent formwork shall be checked for its durability and capability with adjoining concrete before it is used in the structure. It shall be properly anchored to the concrete.
- D.6.8.8 Wire ties passing through beams, columns and walls shall not be allowed. In their place bolts passing through sleeves shall be used. Formwork spacers left in situ shall not impair the desired appearance or durability of the structure by causing spalling, rust staining or allowing the passage of moisture.
- D.6.8.9 For liquid retaining structures sleeves shall not be provided for through bolts or shall through bolts be removed if provided. The bolts, in the latter case, shall be cut at 25 mm depth from the surface and the hole made good by cement mortar of the same proportion as the concrete just after striking the formwork.
- D.6.8.10 Where specified or shown on drawings, all corners and angles exposed in the finished structure shall have chamfers or fillets of 20 mm x 20 mm size.

- D.6.8.11 Forms for substructure may be omitted when, in the opinion of Engineer, the open excavation is firm enough (in hard non-porous soils) to act as a form. Such excavations shall be slightly larger, as directed by Engineer, than that required as per drawing to compensate for irregularities in excavation.
- D.6.8.12 The Contractor shall provide adequate props carried down to a firm bearing without overloading any of the structures.
- D.6.8.13 The shuttering for beams and slabs shall be so erected that the side shuttering of beams can be removed without disturbing the bottom shuttering. If the shuttering for a column is erected for the full height of the column, one side shall be built up in sections as placing of concrete proceeds or windows left for placing concrete from the side limit the drop of concrete to 1.0 m or as directed by Engineer. The Contractor shall temporarily and securely fix items to be cast in (embedment / inserts) in a manner that will not hinder the striking of forms or permit loss of grout.
- D.6.8.14 Formwork showing excessive distortion, during any stage of construction, shall be repositioned and strengthened. Placed concrete affected by faulty form work, shall be entirely removed and formwork corrected prior to placement of new concrete at the cost of the Contractor.
- D.6.8.15 The striking time for formwork shall be determined based on following requirements:
- a) Development of adequate concrete strength;
 - b) Permissible deflection at time of striking form work;
 - c) Curing procedure employed – its efficiency and effectiveness;
 - d) Subsequent surface treatment to be done;
 - e) Prevention of thermal cracking at re-entrant angles;
 - f) Ambient temperature; and
 - g) Aggressiveness of the environment (unless immediate adequate steps are taken to prevent damage to the concrete).
- D.6.8.16 Under normal circumstances (generally where temperatures are above 20 Deg. C) forms may be struck after expiry of the time period given in IS: 456, unless directed otherwise by Engineer. For Portland pozzolona / slag cement the stripping time shall be suitably modified as directed by the Engineer. It is the Contractor's responsibility to ensure that forms are not struck until the concrete has developed sufficient strength to support itself, does not undergo excessive deformation and resist surface damage and any stressed arising during the construction period.
- Note: Vertical member for shuttering /staging must be used in M.S. material.

D.6.9 Reinforcement Workmanship

- D.6.9.1 Reinforcing bars supplied bent or in coils shall be straightened cold without damage at no extra cost. No bending shall be done when ambient temperature is below 5 Deg. C. Local warming may be permitted if steel is kept below 100 Deg. C.
- D.6.9.2 All bars shall be accurately bent gradually and according to the sizes and shapes shown on the drawings / schedules or as directed by Engineer.
- D.6.9.3 Re-bending or straightening incorrectly bent bars shall not be done without approval of Engineer.

D.6.9.4 Reinforcement shall be accurately fixed and maintained firmly in the correct position by the use of blocks, spacers, chairs, binding wire etc. to prevent displacement during placing and compaction of concrete. The tied in place reinforcement shall be approved by Engineer prior to concrete placement. Spacers shall be of such materials and designs as will be durable, not lead to corrosion of the reinforcement and not cause spalling of the concrete cover.

D.6.9.5 Binding wire shall be 16 gauge soft annealed wire. Ends of the binding wire shall be bent away from the concrete surface and in no case encroach into the concrete cover.

D.6.9.6 Substitution of reinforcement, laps / splices not shown on drawing shall be subject to Engineer's approval.

D.6.10 TOLERANCES

D.6.10.1 Tolerance for formed and concrete dimensions shall be as per IS: 456 unless specified otherwise.

D.6.10.2 Tolerances specified for horizontal or vertical building lines or footings shall not be construed to permit encroachment beyond the legal boundaries.

D.6.11 PREPARATION PRIOR TO CONCRETE PLACEMENT

D.6.11.1 Before concrete is actually placed in position, the inside of the formwork shall be cleaned and mould oil applied, inserts and reinforcement shall be correctly positioned and securely held, necessary openings, pockets etc. provided.

D.6.11.2 All arrangements formwork, equipment and proposed procedure, shall be approved by Engineer. **The Contractor shall maintain separate Pour Card for each pour as per the format enclosed** and shall produce before commencement of concreting to Engineer-in-charge.

D.6.12 TRANSPORTING, PLACING AND COMPACTING CONCRETE

D.6.12.1 Concrete shall be transported from the mixing plant to the formwork with minimum time lapse by methods that shall maintain the required workability and will prevent segregation, loss of any ingredients or ingress of foreign matter or water.

D.6.12.2 In all cases concrete shall be deposited as nearly as practicable directly in its final position. To avoid segregation concrete shall not be rehandled or caused to flow. For locations where direct placement is not possible and in narrow forms. The Contractor shall provide suitable drops and 'Elephant Trunks'. Concrete shall not be dropped from a height of more than 1.0 m as stipulated in clause D.6.8.13.

D.6.12.3 Concrete shall not be placed in flowing water. Under water, concrete shall be placed in position by tremies or by pipeline from the mixer and shall never be allowed to fall freely through the water.

D.6.12.4 While placing concrete the Contractor shall proceed as specified below and also ensure the following:

- a) Continuously between construction joints and predetermined abutments.

- b) Without disturbance to forms or reinforcement.
- c) Without disturbance to pipes, ducts, fixings and the like to be cast in; ensure that such items are securely fixed. Ensure that concrete cannot enter open ends of pipes and conduits etc.
- d) Without dropping in a manner that could cause segregation or shock.
- e) In deep pours only when the concrete and formwork designed for this purpose and by using suitable chutes or pipes.
- f) Do not place if the workability is such that full compaction cannot be achieved.
- g) Without disturbing the unsupported sides of excavations; prevent contamination of concrete with earth. Provide sheeting if necessary. In supported excavations, withdraw the lining progressively as concrete is placed.
- h) If placed directly onto hardcore or any other porous material, dampen the surface to reduce loss of water from the concrete.
- i) Ensure that there is no damage or displacement to sheet membranes.
- j) Record the time and location of placing structural concrete.

D.6.12.5 Concrete shall normally be compacted in its final position within thirty minutes of leaving the mixer. Concrete shall be compacted during placing with approved vibrating equipment without causing segregation until it forms a solid mass free from voids thoroughly worked around reinforcement and embedded fixtures and into all corners of the formwork. Immersion vibrators shall be inserted vertically at points not more than 450 mm apart and withdrawn slowly till air bubbles cease to come to surface, leaving no voids. When placing concrete in layers advancing horizontally, care shall be taken to ensure adequate vibration, blending and melding of the concrete between successive layers. Vibrators shall not be allowed to come in contact with reinforcement, formwork and finished surfaces after start of initial set. Over vibration shall be avoided.

D.6.12.6 Concrete may be conveyed and placed by mechanically operated equipment after getting the complete procedure approved by Engineer. The slump shall be held to the minimum necessary for conveying concrete by this method. When concrete is to be pumped concrete mix shall be specially designed to suit pumping. Care shall be taken to avoid stoppages in work once pumping has started.

D.6.12.7 Except when placing with slip forms, each placement of concrete in multiple lift work, shall be allowed to set for at least 24 hours after the final set of concrete before the start of subsequent placement. Placing shall stop when concrete reaches the top of the opening in walls or bottom surface of slab, in slab and beam construction, and it shall be resumed before concrete takes initial set but not until it has had time to settle as determined by Engineer. Concrete shall be protected against damage until final acceptance.

D.6.13 MASS CONCRETE WORKS

D.6.13.1 Sequence of pouring for mass concrete works shall be as approved by Engineer. The Contractor shall exercise great care to prevent shrinkage cracks and shall monitor the temperature of the placed concrete if directed.

D.6.14 CURING

- D.6.14.1 Curing and protection shall start immediately after the compaction of the concrete to protect it from:
- (a) premature drying out, particularly by solar radiation and wind;
 - (b) leaching out by rain and flowing water;
 - (c) rapid cooling during the first few days after placing;
 - (d) high internal thermal gradients;
 - (e) low temperature of frost;
 - (f) Vibration and impact which may disrupt the concrete and interfere with its bond to the reinforcement.
- D.6.14.2 All concrete, unless directed otherwise by Engineer, shall be cured by use of continues sprays or ponded water or continuously saturated coverings of sacking, canvas, hessian or other absorbent material for the period of complete hydration with a minimum of 7 days. The quality of curing water shall be the same as that used for mixing.
- D.6.14.3 Where a curing membrane is directed to be used by the Engineer, the same shall be of a non-wax base and shall not impair the concrete finish in any manner. The curing compound to be used shall be got approved from the Engineer before use and shall be applied with spraying equipment capable of a smooth, even textured coat.
- D.6.14.4 Curing may also be done by covering the surface with an impermeable material such as polyethylene, which shall be well sealed and fastened.
- D.6.14.5 Extra precautions shall be exercised in curing concrete during cold and hot weather.
- D.6.15 CONSTRUCTION JOINTS AND KEYS**
- D.6.15.1 Construction joints will be as shown on the drawing or as approved by Engineer. Concrete shall be placed without interruption until completion of work between construction joints. If stopping of concreting becomes unavoidable anywhere, a properly formed construction joint shall be made with the approved of Engineer.
- D.6.15.2 Dowels for concrete work, not likely to be taken up in the near future, shall be coated with cement slurry and encased in lean concrete as indicated on the drawings or as directed by Engineer.
- D.6.15.3 Before resuming concreting on a surface which has hardened all laitance and loose stone shall be thoroughly removed by wire brushing / hacking and surface washed with high pressure water jet and treated with thin layer of cement slurry for vertical joints and a 15 mm thick layer of cement sand mortar for horizontal layers, the ratio of cement and sand being the same as in the concrete mix.
- D.6.15.4 When concreting is to be resumed on a surface which has not fully hardened, all laitance shall be removed by wire brushing, the surface wetted, free water removed and a coat of cement slurry applied. On this a layer of concrete not exceeding 150 mm thickness shall be placed and well rammed against the old work. Thereafter work shall proceed in the normal way.
- D.6.16 FOUNDATION BEDDING**

D.6.16.1 All earth surfaces upon which or against which concrete is to be placed, shall be well compacted and free from standing water, mud or debris. Soft or spongy area shall be cleaned out and back filled with either soil cement mixture, lean concrete or clean sand compacted as directed by Engineer. The surfaces of absorptive soils shall be moistened.

D.6.16.2 Concrete shall not be deposited on large sloping rock surfaces. The rock shall be cut to form rough steps or benches by picking, barring or wedging. The rock surface shall be kept wet for 2 to 4 hours before concreting.

D.6.17 FINISHES

D.6.17.1 General

D.6.17.1.1 The formwork for concrete works shall be such as to give the finish as specified. The Contractors shall make good as directed any unavoidable defects consistent with the type of concrete and finish specified; defects due to bad workmanship (e.g. damaged or misaligned forms, defective or poorly compacted concrete) will not be accepted. The Contractor shall construct the formwork using the correct materials and to meet the requirements of the design and to produce finished concrete to required dimensions, plumbs, planes and finishes.

D.6.17.2 Surface finish Type F1

D.6.17.2.1 This type of finish shall be for non-exposed concrete surface against which back fill or concrete is to be placed. The main requirement is that of dense, well compacted concrete. No treatment is required except repair of defective areas, filling all form tie holes and cleaning up of loose or adhering debris. For surfaces below grade which will receive waterproofing treatment the concrete shall be free of surface irregularities which could interfere with proper and effective application or waterproofing material specified for use.

D.6.17.3 Surface finish Type F2

D.6.17.3.1 This type of finish shall be for all concrete work which will be exposed to view upon completion of the job. The appearance shall be that of a smooth dense, well-compacted concrete showing the slight marks of well fitted shuttering joints. The Contractor shall make good any blemishes.

D.6.17.4 Surface finish Type F3

D.6.17.4.1 This type of finish shall be for concrete work which will be exposed to view but to give an appearance of smooth, dense, well-compacted concrete with no shutter marks, stain free and with no discoloration, blemishes, arises, air holes etc. Only lined or coated plywood with very tight joints shall be used to achieve this finish. The panel size shall be uniform and as large as practicable. Any minor blemishes that might occur shall be made good by Contractor.

D.6.17.5 Integral cement finish on concrete floor

D.6.17.5.1 In all cases where integral cement finish on a concrete floor has been specified, the top layer of concrete shall be screened off to proper level and tamped with tamper having

conical projections so that the aggregate shall be forced below the surface. The surface shall be finished with a wooden float and a trowel with pressure. The finish shall be continued till the concrete reaches its initial set. No cement or cement mortar finish shall be provided on the surface. Where specified, a floor hardener as approved by the Engineer shall be supplied and used as recommended by the manufacturer.

D.6.18 REPAIR AND REPLACEMENT OF UNSATISFACTORY CONCRETE

- D.6.18.1 Immediately after the shuttering is removed, all the defective areas such as honey-combed surfaces, rough patches, and holes left by form bolts etc. shall be brought to the notice of Engineer who may permit patching of the defective areas or reject the concrete work.
- D.6.18.2 All through holes for shuttering shall be filled for full depth and neatly plugged flush with surface.
- D.6.18.3 Rejected concrete shall be removed and replaced by Contractor at no additional cost to Client.
- D.6.18.4 For patching of defective areas all loose materials shall be removed and the surface shall be prepared as directed by the Engineer.
- D.6.18.5 Bonding between hardened and fresh concrete shall be done either by placing cement mortar or by applying epoxy. The decision of the Engineer as to the method of repairs to be adopted shall be final and binding on the Contractor and no extra claim shall be entertained on this account. The surface shall be saturated with water for 24 hours before patching is done with 1:5 cement sand mortar. The use of epoxy for bonding fresh concrete shall be carried out as directed by Engineer.

D.6.19 VACUUM DEWATERING OF SLABS

- D.6.19.1 Where specified floor slabs, either on grade or suspended, shall be finished by vacuum dewatering including all operations such as poker vibration, surface vibration, vacuum processing, floating and trowelling as per equipment manufacturers recommendation. The equipment to be used shall be subject to Engineer's approval.

D.6.20 HOT WEATHER REQUIREMENTS

- D.6.20.1 Concreting during hot weathers shall be carried out as per IS: 7861 (Part – I)
- D.6.20.2 Adequate provisions shall be made to lower concrete temperatures which shall not exceed 40 Deg. C at the time of placement of fresh concrete.
- D.6.20.3 Where directed by Engineer, Contractor shall spray non-wax based curing compound of unformed concrete surfaces at no extra costs.

D.6.21 COLD WEATHER REQUIREMENTS

- D.6.21.1 Concreting during cold weather shall be carried out as per IS: 7861 (Part-II).

- D.6.21.2 The ambient temperature during placement and upto final set shall not fall below 5 Deg. C. Approved antifreeze / accelerating additives shall be used where directed.
- D.6.21.3 For major and large scale concreting works the temperature of concrete at times of mixing and placing, the thermal conductivity of the formwork and its insulation and stripping period shall be closely monitored.

D.6.22 LIQUID RETAINING STRUCTURES

- D.6.22.1 The Contractor shall take special care of concrete for liquid retaining structures, underground structures and those others specifically called for to guarantee the finish and water tightness.
- D.6.22.2 The minimum level of surface finish for liquid retaining structures shall be type F2. All such structures shall be hydro-tested.
- D.6.22.3 The Contractor shall include in his price of hydro-testing of structure, all arrangements for testing such as temporary bulk heads, pressure gauges, pumps, pipelines etc.
- D.6.22.4 Any temporary arrangements that may have to be made to ensure stability of the structures shall also be considered to have been taken into account while quoting the rates.
- D.6.22.5 Any leakage that may occur during the hydro-test or subsequently during the defects liability period or the period for which the structure is guaranteed shall be effectively stopped either by cement / epoxy pressure grouting, gunniting or such other methods as may be approved by the Engineer. All such rectification of the Client / Engineer at no extra cost to the Client.

D.6.23 TESTING CONCRETE STRUCTURES FOR LEAKAGE

- D.6.23.1 Hydro-static test for water tightness shall be done at full storage by Engineer, as described below:
- D.6.23.1.1 In case of structures whose external faces are exposed, such as elevated tanks, the requirements of the test shall be deemed to be satisfied if the external faces show no sign of leakage or sweating and remain completely dry during the period of observation of seven days after allowing a seven day period for absorption after filling with water.
- D.6.23.1.2 In the case of structures whose external faces are submerged and are not accessible for inspection, such as underground tanks, the structures shall be filled with water and after the expiry of seven days after the filling, the level of the surface of the water shall be recorded. The level of water shall be recorded again at subsequent intervals of 24 hrs. over a period of seven days. Backfilling shall be withheld till the tanks are tested. The total drop in surface level over a period for seven day shall be taken as an indication of the water tightness of the structure. The Engineer shall decide on the actual permissible nature of this drop in the surface level, taking into account weather the structures are open or closed and the corresponding effect it has on evaporation losses. Unless specified otherwise, a structure whose top is covered shall be deemed to

be water tight if the total drop in the surface level over a period of seven days does not exceed 40 mm.

D.6.23.1.3 Each compartment / segment of the structure shall be tested individually and then all together.

D.6.23.2 For structures such as pipes, tunnels etc. the hydro-static test shall be carried out by filling with water, after curing as specified, and subjecting to the specified test pressure for specified period. If during this period the loss of water does not exceed the equivalent of the specified rate, the structure shall be considered to have successfully passed the test.

D.6.24 OPTIONAL TESTS

D.6.24.1 If Engineer feels that the materials i.e. cement, sand coarse aggregates, reinforcement and water are not in accordance with the specifications or if specified concrete strengths are not obtained, he may order tests to be carried out on these materials in laboratory, to be approved by the Engineer, as per relevant IS Codes. Client shall pay only for the testing of material supplied by the Client, otherwise Contractor shall have to pay for the tests. Transporting of all material to the laboratory shall however be done by the Contractor at no extra cost to Client.

D.6.24.2 In the event of any work being suspected of faulty material or workmanship requiring its removal or if the works cubes do not give the stipulated strengths, Engineer reserves the right to order the Contractor to take out cores and conduct tests on them or do ultrasonic testing or load testing of structure, etc. All these tests shall be carried out by Contractor at no extra cost to the Client. Alternatively Engineer also reserves the right to ask the Contractor to dismantle and re-do such unacceptable work at the cost of Contractor.

D.6.24.3 If the structure is certified by Engineer as having failed, the cost of the test and subsequent dismantling / reconstruction shall be borne by Contractor.

D.6.24.4 The quoted unit rates / prices of concrete shall be deemed to provide for all tests mentioned above.

D.6.25 GROUTING

D.6.25.1 Grout shall be provided as specified on the drawings. The proportion of standard Grout shall be such as to produce a flow able mixture consistent with minimum water content and shrinkage. Surface to be grouted shall be thoroughly roughened and cleaned. All structural steel elements to be grouted, shall be cleaned of oil, grease, dirt etc. The use of hot, strong caustic solution for this purpose will be permitted. Prior to grouting, the hardened concrete shall be saturated with water and just before grouting water in all pockets shall be removed. Grouting once started shall be done quickly and continuously. Variation in grout mixes and procedures shall be permitted if approved by ENGINEER. The grout proportions shall be limited as follows:

	Use	Grout Thickness	Mix Proportions	W/C Ratio
a)	Fluid mix	Under 25 mm	One part Portland cement to one part sand.	0.44
b)	General Mix	25 mm and over but less than 50 mm	One part Portland cement to 2 part sand.	0.53
c)	Stiff mix	50 mm and over	One part Portland cement to 3 part sand.	0.53

D.6.25.2 Non Shrink Grout

- D.6.25.2.1 Non-shrink grout where called for in the Schedule of Quantities or specified on the drawings shall be provided in strict accordance with the manufacturer's instructions/specifications on the drawings.

D.6.26 INSPECTION

- D.6.26.1 All materials, workmanship and finished construction shall be subject to continuous inspection and approval of Engineer. Materials rejected by Engineer shall be expressly removed from site and shall be replaced by Contractor immediately at no extra cost to Client.

D.6.27 CLEAN-UP

- D.6.27.1 Upon the completion of concrete work, all forms, equipment, construction tools, protective coverings and any debris, scraps of wood etc. resulting from the work shall be removed and the premises left clean.

D.6.28 ACCEPTANCE CRITERIA

- D.6.28.1 Any concrete work shall satisfy the requirements given below individually and collectively for it to be acceptable.

- a) Properties of constituent materials;
- b) Characteristic compressive strength;
- c) Specified mix proportions;
- d) Minimum cement content;
- e) Maximum free-water / cement ratio;
- f) Workability;
- g) Temperature of fresh concrete;
- h) Density of fully compacted concrete;
- i) Cover to embedded steel;
- j) Curing;
- k) Tolerances in dimensions;
- l) Tolerances in levels;
- m) Durability;
- n) Surface finishes;
- o) Special requirements such as :
 - i) Water tightness;
 - ii) resistance to aggressive chemicals
 - iii) resistance to freezing and thawing
 - iv) very high strength
 - v) improved fire resistance
 - vi) wear resistance
 - vii) resistance to early thermal cracking

- D.6.28.2 The Engineer's decision as to the acceptability or otherwise of any concrete work shall be final and binding of the Contractor.

D.6.28.3 For work not accepted, the Engineer may review and decide whether remedial measures are feasible so as to render the work acceptable. The Engineer shall in that case direct the Contractor to undertake and execute the remedial measures. These shall be expeditiously and effectively implemented by the Contractor. Nothing extra shall become payable to the Contractor. Nothing extra shall become payable to the Contractor by the Client for executing the remedial measures.

D.6.29 MODE OF MEASUREMENT AND PAYMENT

D.6.29.1 The unit rate for concrete work under various categories shall be all inclusive and no claims for extra payment on account of such items as leaving holes, embedding inserts, etc. shall be entertained unless separately provided for in the schedule of quantities. No extra claim shall also be entertained due to change in the number, position and / or dimensions of holes, slots or openings, sleeves, inserts or on account of any increased lift, lead of scaffolding etc. All these factors should be taken into consideration while quoting the unit rates. Unless provided for in the Schedule of Quantities the rates shall also include fixing insets in all concrete work, whenever required.

D.6.29.2 Payments for concrete will be made on the basis of unit rates quoted for the respective items in the Schedule of Quantities. No deduction in the concrete quantity will be made for reinforcements, inserts etc. and opening less than 0.100 of a sq.m in areas where concrete is measured in sq.m and 0.010 cu.m where concrete is measured in cu.m. Where no such deduction for concrete is made, payment for shuttering work provided for such holes, pockets, etc. will not be made. Similarly the unit rates for concrete work shall be inclusive or exclusive of shuttering as provided for in the Schedule of Quantities.

D.6.29.3 Payment for beams will be made for the quantity based on the depth being reckoned from the underside of the slabs and length measured as the clear distance between supports. Payment for columns shall be made for the quantity based on height reckoned up to the underside of slab / beams.

D.6.29.4 The unit rate for precast concrete members shall include formwork, moulding, finishing, hoisting and setting in position including setting mortar, provision of lifting arrangement etc. complete. Reinforcement and inserts shall be measured and paid for separately under respective item rates.

D.6.29.5 Only the actual quantity of steel embedded in concrete including laps as shown on drawings or as approved by Engineer shall be measured and paid for, irrespective of the level or height at which the work is done. The unit rates for reinforcement shall include lap chairs, spacer bars etc.

D.6.29.6 Where the formwork is paid for separately, it shall be very clearly understood that payment for formwork is inclusive of formwork, shuttering, shoring, propping scaffolding etc. complete. Only the net area of concrete formed (shuttered) shall be measured for payment. Unless otherwise stated clearly form work will not be paid separately and it is deemed to be included in the respective concrete item.

Under remarks indicate deviations from drawings & specifications congestion in reinforcement if any unusual occurrences such as failure of equipment sinking of supports / props, heavy rain affecting reasonable. Poor compaction improper curing other deficiencies observations etc.

D.6.30 USE OF SULPHATE RESISTANCE CEMENT

D.6.30.1 Under this contract, cement to be used for all concrete, plaster etc. which are likely in contact with water ordinary Portland cement to be used.

D.6.31 MATERIALS: STRUCTURAL STEEL

All structural steel shall be comply with the requirements of IS 226-1961 and structural steel work IS 1915-1962 specifications for structural steel appropriate for bridge work.

D.6.31.1 Steel for Pins and Rollers

Rolled steel pins and rollers, shall comply with requirements of the IS specifications appropriate for the work. Steel casting for cast steel pins shall conform to grade 1 or 3 of IS 1030-1956 specifications for steel casting (for general engineering purposes as appropriate).

D.6.31.2 Bolts and Nuts

Mild steel for bolts and nuts when tested shall comply with IS 1608-1960 and shall have tensile strength of not less than 2500 Kg/cm². Plain washers shall be made of steel.

D.6.31.3 Welding Electrode

Mild steel electrodes shall comply with requirements of IS 814-1957 specification for covered electrodes for metal arc welding of mild steel.

D.6.31.4 Workmanship

All work shall be in accordance with the drawings and shall satisfy IS specification No. 1915-1961. Care shall be taken to ensure that all parts in assembly fit accurately together. Notes or specifications on the drawings supplied by the Engineer-in-Charge/consulting Engineer, are to be constructed as superseding or cancelling any clause of this specifications with which they conflict. On all drawings dimensions shown in figures shall be acted in preference to measurement by scale.

D.6.31.5 Straightening

All structural steel members and parts shall have straight edges. All straightening shaping and leveling etc. shall be done by pressure only and not by hammering. All joggles and knees shall be formed by pressure and where practicable in making these, the metal shall not be cut and welded.

D.6.31.6 Cutting

All structural steel parts where required shall be sheared, cropped sawn or flame cut and ground accurately to the required dimensions and shape.

D.6.31.7 Bolts Holes

The diameter of bolts holes shall be 1.5 to 2.0 mm. larger than the nominal diameter of bolt. All holes for bolts shall be drilled unless permitted by Engineer-in-Charge for punching the holes. Care shall be taken, such as surrounding material is not deformed or damaged in case of punching the hole is allowed.

D.6.31.8 Welding

Welding of steel conforming to relevant IS specifications shall be in accordance with general requirements of metal arc welding. In addition to general requirement, the following care shall be taken:-

- (a) The welding shall be positioned for downward welding wherever practicable.
- (b) The welding current shall conform with respect of voltage and ampere to the recommendations of the manufacturers of the electrode being used. The arc length, voltage and ampere shall be suited to the thickness of material, type of groove and other circumstances of the work.
- (c) The surface to be welded and surrounding material for a distance of atleast 155 mm shall be free from scale, dirt, grease, paint, heavy rust or other surface deposit.
- (d) Members to be welded shall be held in correct position by holes, clamps, wedges, jigs or other suitable devices or by tack welding until welding has been completed, such fastening as may be used shall be adequate to ensure safety. Suitable allowance shall be made for war page and shrinkage.
- (e) Tack welds located where the final welds will later be made shall be subject to the same quality requirements as final welds. Defective and broken tack welds shall be removed before final welding.
- (f) Fusion faces shall be made or cut by shearing, chipping, machining or by gas cutting.
- (g) Exposed faces of welds shall be made reasonably smooth and regular so as to conform as closely as practicable to design requirements and shall not be of less than the required cross section.
- (h) Finished welds and adjacent parts shall be protected with clean boiled linseed oil after all slag has been removed.

D.6.31.9 Safety Precautions

- D.6.31.9.1
 - (a) Operators of welding and cutting equipment shall be protected from the rays of the arc flame gloves and by helmet, hand shields, or goggles equipped with suitable filter lenses.
 - (b) Closed space shall be ventilated properly while welding is being gone therein.
 - (c) Welders should be provided with such staging as will enable them to perform the welding operation. For site welding shelter should be provided to protect welders and the parts to be welded from the weather.
- D.6.31.9.2 The Constructor shall employ a competent welding supervisor to ensure that the standard of workmanship and the quality of materials comply with requirements laid in these specification.
- D.6.31.9.3 The Constructor shall provide free access to the representative of Engineer-in-Charge/Consulting Engineer to the work being carried out at all reasonable times and facilities shall be provided so that during the course of welding he may be able to inspect

any layer of weld metal. He shall be at liberty to reject any material that does not conform to the terms of the specifications and to require any defective welds to be cut out and welded. The representative of the Engineer-in-Charge/Consulting Engineer shall be notified in advance of any welding operations.

D.6.31.9.4 Inspection and testing of welds shall be done as laid down in IS 822 and IS 11017.

D.6.31.9.5 No welder shall be employed in any position except those who are fully qualified to welding. Qualification for welders shall be as laid down in IS 812.

D.6.31.10 Joints

All steel work intended to be bolted together must be in contact over the whole surface. Joints which have to take compressive stress and the ends of all stiffeners shall meet truly over the whole of the butting surface.

D.6.31.11 Assembling

All member shall be so arranged that they can be accurately assembled, without being unduly packed, strained or forced into position and when built shall be true and free from twist kinks, buckets or open joints between component pieces. Work shall be kept properly bolted together and no drifting shall be allowed except for the purpose of drawing assembled sections together in accuracy's in matching of holes may be corrected. But drifting to enlarge holes is prohibited. Failure in any of the above respect will involve the rejection of defective members.

D.6.31.12 Mode of Measurement and Payment

D.6.31.12.1 Measurement of this item shall be as per IS 1200(Part VIII) - 1974 or as per its latest revision so far as applicable.

D.6.31.12.2 The contract rate shall be suitable for unit of one metric tonne of structural steel.

D.6.32 MATERIALS: REINFORCEMENT

D.6.32.1 Specification for TMT bars reinforcement (Fe-415/500)

D.6.32.1.1 Scope of work:

The scope of work consists of providing and laying mild steel reinforcement and TMT reinforcement for RCC works of various components of the structure. This includes cuttings, bending, binding, placing, with all equipments and labour required for the work as directed by the Engineer-in-charge and all operations covered within the intent and purpose of the specification.

D.6.32.1.2 Bending of Reinforcement:

Reinforcing steel shall conform accurately to the dimensions shown on relevant drawings and conforming to the relevant IS codes (latest revision)

Bars shall be bent cold to the specified shape and dimensions or as directed by the Engineer-in-charge using a proper bar bender, operated by hand or power to attain proper radii of bends.

Bars shall not be bent or straightened in a manner that will cause injury to the material.

Bars bent during transport or handling shall be straightened before being used on work; they shall not be heated to facilitate bending.

The bending of the TMT bars shall be carried out as per the following:

Sr. No.	Operation	Size	TMT Fe-415
1	Bend	Upto 22 mm dia.	3d
		Over 22 mm dia.	4d
2	Rebend	Upto 10 mm dia.	4d
		Over 10 mm dia.	5d

D.6.32.1.3 Placing of Reinforcement:

All reinforcing bars shall be accurately placed in the exact position shown on the drawings, and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm. in size and conforming to IS: 280 and by using stays blocks or metal chairs, spacer, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars will not be allowed to sag between supports nor displaced during concreting or any other operation over the work. All devices used for positioning shall be of noncorrodible material. Wooden and metal supports will not extend to the surface of concrete, except where shown on the drawings, Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing will not be allowed. Pieces of broken stone, brick or wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, precast mortar blocks or other approved devices. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed.

To protect reinforcement from corrosion, concrete cover shall be provided as indicated on the drawings. All bars protruding from concrete to which other bars are to be spliced and which are likely to be exposed for an indefinite period shall be protected by a thick coat of neat cement grout.

In the case of columns and walls, vertical bars shall be kept in normal position with timber templates having slots accurately cut in for bar position. Such templates shall be removed after the concreting has progressed upto a level just below them.

Bars crossing each other, where required, shall be secured by binding wire (annealed) of size not less than 1 mm and conforming to IS : 280 in such a manner that they do not slip over each other at the time of fixing and concreting. As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed by the Engineer-in-charge. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm or 1 1/4 times the maximum size of the coarse aggregates whichever is greater, by concrete between them. Where this is not feasible, overlapping bars shall be bound with annealed steel wire, not less than 1mm thickness twisted tight in

eight shape around the lapped bars. The overlaps shall be staggered for different bars and located at fixed locations only along the span where neither shear nor bending moment is maximum.

D.6.32.1.4 Welding of Bars

Welding of TMT bars can be permitted if specified on the drawings, joints of reinforcement bars shall be butt welded so as to transmit their full strength. Welded joints shall preferably be located at points where steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section, not more than 33 per cent of the rods are welded. No pre-warming or post heat treatment is necessary. Interpass temperature should be limited to 200°C with low heat input and equivalent strength low hydrogen type electrode. Suitable means shall be provided for holding the bars securely in position during welding. It must be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work.

Welded pieces of reinforcement shall be tested. Specimens shall be taken from the actual site and their number and frequency of tests shall be as directed by the Engineer-in-charge.

D 6.32.2 Specification of CRS- Steel:

Providing, cleaning, straightening cutting, bending, placing in position, binding with M.S. binding wires including providing concrete cover blocks, CRS Fe-500) deformed bars confirming to IS 1786 for various reinforced concrete members at all levels.

General:

Requirement specified here in provided for reinforcing work, complete as indicated, specified and required and including supply and delivery of reinforcing bars, and mesh, bending, wire brushing and cleaning, steel fixing and the attendance of a fitter during concreting, to inspect fixed reinforcing bars and maintain bars in correct position at each four locations. Whenever mention of I.S. code is made, the latest editions thereof shall be applicable.

Quality Assurance:

Code requirement -

Unless otherwise stated herein all work specified herein and as shown on the drawings shall conform to be applicable requirement of IS-456-latest edition. In case of water retaining structure IS-3370 Part-I and IV shall be applicable.

Standards:

Steel for reinforcing shall be of the following kinds as may be specified in the drawings. Mild steel plain bars conforming to IS:432-1960 and its latest edition. Corrosion Resistant Steel (CRS) bars conforming to IS:1786 and its latest edition.

Field quality control:

All continuous inspections shall be performed by the Engineer-in-charge's representative or his authorized assistant or a specialist called by the dream city ltd. or the Engineer-in-charge. Reports as required by code or authorities concerned shall be prepared and submitted to the Dream city ltd.

and such authorities. The steel brought by the contractor when tested should comply with the test specifications in IS:1521 and IS:1608-1960.

Submittals:

Drawing:

The Engineer-in-charge will supply detail drawing of reinforced concrete work and bar bending schedules. The contractor shall check the drawing and the schedules and satisfy himself that these complement each other. In the event of a discrepancy the Engineer-in-charge shall be notified in writing and his ruling obtained.

Materials:

A] Reinforcing bars:

Reinforcement bars shall have to be brought by the Contractor as laid down in the tender condition.

B] Welded Wire mesh:

Mesh reinforcement, where specified shall conform to IS:1566-1967.

C] Binding wire:

Steel fixing shall be by 1.65 mm dia soft annealed wire.

D] Supports and Accessories:

Supports, cover or spacer for reinforcement shall be provided by precast mortar [1:2] blocks made with embedded wire ties. The cover blocks shall be made so as to provide the exact specified cover to reinforcement. Stays, blocks, ties, spacers or other supports as approved by Engineer-in-charge shall be provided at appropriate intervals to avoid sagging of bars between supports. Broken stones, bricks pieces, wooden blocks shall not be allowed.

E] Dowels:

Where and as designated on the drawings, steel bars dowels shall be provided for anchorage to previously cast concrete for anchorage where shown or required to existing construction, an approved non-shrink epoxy type grout or approved deferred bolting devices shall be used.

Execution:

A] Bending:

Unless otherwise indicated or specified bars shall be bent and fixed in accordance with the provisions of IS:2502. All bending shall be done with the use of an approved bending tool. Rebinding of incorrectly bent bars shall not be permitted.

B] Cleaning:

Before placing reinforcement and again before concrete is placed, reinforcement shall be wire-brushed and cleaned of loose mill scale, oil, or other coating that might destroy or reduce bond.

C] Concrete cover:

Cover over reinforcing bars shall be as indicated. Correct concrete cover to reinforcement shall be maintained with the aid of approved cover blocks. Top reinforcement in slabs shall be maintained in position by means of chairs made out of mild steel, the diameter and quantity bending sufficient to ensure security of the reinforcement in shape and position.

D] Securing in place:

All reinforcement shall be securely and accurately fixed in positions shown on the drawings, care being taken to prevent contact with coated shuttering and forms. All intersection of bar should be secured with approved clips or with wire, the ends being turned into the body of concrete.

E] Splices shall be wired contact lap splices unless otherwise indicated or approved. Splices at points of maximum tensile stress shall be avoided and shall be staggered elsewhere, lap length and other provisions shall conform to IS:456. Splicing of vertical bars in concrete be at approved positions.

Unless otherwise shown in case of horizontal bars lap splices shall be made with at least one continuous bar between adjacent splices, where double mats of bars occur in walls, lap splices in opposite mats shall offset at least 1.5 m.

Welding: -

When permitted or required joints of reinforcement bars shall be welded so as to transmit their full stresses. Welded joints shall preferably be located at points when steel will not be subjected to more than 75% of the maximum permissible stresses and welds so staggered that at any one section not more than 20% of the rods are welded. Only electric welding using a process which excludes air from molten and conforms to any or all other special provisions of or the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in two or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S. electrodes used for welding shall conform to IS:814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency of test shall be as directed.

D-7: GENERAL BUILDING WORKS AND ADDITIONAL SPECIFICATIONS

SECTION: D-7

D.7.1 SCOPE

This specification covers the general requirement for building works comprising brick and stone masonry, flooring, doors, windows, ventilators, wood / aluminum work, water proofing, plastering, painting and such other related works forming a part of this job, which may be required to be carried out though not specifically mentioned above. The work under these specifications shall consist of furnishing of all tools, plants, labour, materials, any and everything necessary for carrying out the work.

D.7.2 APPLICABLE CODES AND SPECIFICATIONS

D.7.2.1 The following codes, standards and specifications are made a part of these specifications. All standards, specification, codes of practices referred to herein shall be latest edition including all applicable official amendments and revisions.

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

- | | |
|------------|--|
| IS : 110 | - Ready mixed paint, brushing, and grey filler, for enamels for use over primers. |
| IS : 269 | - Specification for 33 grade ordinary Portland cement |
| IS : 280 | - Specification for mild steel wire for general engineering purposes. |
| IS : 383 | - Specification for coarse and fine aggregate from natural sources for concrete. |
| IS : 428 | - Distemper, oil emulsion, colour as required |
| IS : 1077 | - Specification for Common burnt clay building, bricks |
| IS : 2116 | - Specification for sand for masonry mortars |
| IS : 2212 | - Code of practice for brick work |
| IS : 2250 | - Code of practice for preparation and use of masonry mortars |
| IS : 2395 | - Code of practice for painting concrete, masonry and plaster surfaces (Parts 1 & 2). |
| IS : 3495 | - Method of sampling and testing clay building bricks |
| IS : 3696 | - Safety code of scaffolds and ladders (Part 1 & 2) |
| IS : 5410 | - Cement paint, colour as required. |
| IS : 5491 | - Code of practice for laying off in situ granolithic concrete floor topping. |
| IS : 8042 | - Specification for White Portland cement. |
| IS : 9197 | - Specification for epoxy resin, hardeners and epoxy resin composites for floor topping. |
| IS : 9862 | - Specification for ready mixed paint, brushing, bituminous, black, lead-free, acid, alkali, water and chlorine resisting. |
| IS : 12200 | - Code of practice for provision of water stops at transverse contraction joints in masonry and concrete dams. |

D.7.3 BRICK WORK

D.7.3.1 Materials

- D.7.3.1.1 Bricks used in the works shall confirm to the requirements laid down in IS: 1077. The class of the bricks shall be as specifically indicated in the respective items of work.
- D.7.3.1.2 The nominal size of the modular brick shall be 200 mm x 100 mm x 100 mm with the permissible tolerances over the actual size of 190 mm x 90 mm x 90 mm as per IS : 1077. The nominal thickness of one brick and half brick walls using modular bricks shall be considered as 200 mm and 100 mm respectively. In the event of use of traditional bricks of nominal size 230 mm x 115 mm x 75 mm with tolerance up to +3 mm in each dimension, one brick and half brick walls shall be considered as 230 mm and 115 mm respectively.
- D.7.3.1.3 Bricks shall be sound, hard, and homogenous in texture, well burnt in kiln without being vitrified, hand / machine moulded, deep red, cherry or copper coloured, of regular shape and size & shall have sharp and square edges with smooth rectangular faces. The bricks shall be free from pores, cracks, flaws and nodules of free lime. Hand moulded bricks shall be moulded with a frog and those made by extrusion process may not be provided with a frog. Bricks shall give a clear ringing sound when struck and shall have minimum crushing strength of 5 N/sq.mm unless otherwise specified in the item.
- D.7.3.1.4 The average water absorption shall not be more than 20 percent by weight upto class 12.5 and 15 percent by weight for higher classes. Bricks which do not conform to this requirement shall be rejected. Over or under burnt bricks are not acceptable for use in the works.
- D.7.3.1.5 Sample bricks shall be submitted to the Engineer for approval and bricks supplied shall conform to approved samples. If demanded by Engineer, brick samples shall be got tested as per IS: 3495 by Contractor at no extra cost to Owner. Bricks rejected by Engineer shall be removed from the site of works within 24 hours.
- D.7.3.1.6 Mortar for brick masonry shall consist of cement and sand and shall be prepared as per IS: 2250. Mix shall be in the proportion of 1:4, 1:5 or 1:6 as specified for brickwork of thickness one brick or above and 1:4 for brickwork of thickness half brick or below, unless otherwise specified in the respective items of work. Sand for masonry mortar shall conform to IS: 2116. The sand shall be free from clay, shale, loam, alkali and organic matter and shall be of sound, hard, clean and durable particles. Sand shall be approved by Engineer. If so directed by the Engineer, sand shall be screened and washed till it satisfies the limits of deleterious materials.
- D.7.3.1.7 For preparing cement mortar, the ingredients shall first be mixed thoroughly in dry condition. Water shall then be added and mixing continued to give a uniform mix of required consistency. Mixing shall be done thoroughly in a mechanical mixer, unless hand mixing is specifically permitted by the Engineer. The mortar thus mixed shall be used as soon as possible, preferably within 30 minutes from the time water is added to cement. In case, the mortar has stiffened due to evaporation of water, this may be tempered by adding water as required to restore consistency, but this will be permitted only upto 30 minutes from the time of initial mixing of water to cement. Any mortar which is partially set shall be rejected and shall be removed forth with from the site. Droppings of mortar shall not be re-used under any circumstances.

D.7.3.1.8 The Contractor shall arrange for test on mortar samples if so directed by the Engineer.

D.7.3.2 Workmanship

D.7.3.2.1 Workmanship of brick work shall conform to IS: 2212. All bricks shall be thoroughly soaked in clean water for at least one hour immediately before being laid. The cement mortar for brick masonry work shall be as specified in the respective item of work. Brick work 200 mm / 230 mm thick and over shall be laid in English Bond unless otherwise specified. 100 mm/115 mm thick brickwork shall be laid with stretchers. For laying bricks, a layer of mortar shall be spread over the full width of suitable length of the lower course. Each brick shall be slightly pressed into the mortar and shoved into final position so as to embed the brick fully in mortar. Only full size bricks shall be used for the works and cut bricks utilized only to make up required wall length or for bonding. Bricks shall be laid with frogs uppermost.

D.7.3.2.2 All brickwork shall be plumb, square and true to dimensions shown. Vertical joints in alternate courses shall come directly one over the other and be in line. Horizontal courses shall be leveled. The thickness of brick thick or half brick thick wall, at least one face should be kept smooth and plane, even if the other is slightly rough due to variation in size of bricks. For walls of thickness greater than one brick both faces shall be kept smooth and plane. All interconnected brickwork shall be carried out at nearly one level so that there is uniform distribution of pressure on the supporting structure and no portion of the work shall be left more than one course lower than the adjacent work. Where this is not possible, the work shall be raked back according to bond (and not saw toothed) at an angle not exceeding 45°. But in no case the level difference between adjoining walls shall exceed one metre. Brick work shall not be raised more than one metre per day.

D.7.3.2.3 Bricks shall be so laid that all joints are well filled with mortar. The thickness of joints shall not be less than 6 mm and not more than 10 mm. The face joints shall be raked to a minimum depth of 10 mm / 15 mm by raking tools during the progress of work when the mortar is still green, so as to provide a proper key for the plastering / pointing respectively to be done later. When plastering or pointing is not required to be done, the joints shall be uniform in thickness and be struck flush and finished at the time of laying. The face of brick work shall be cleaned daily and all mortar droppings removed. The surface of each course shall be thoroughly cleaned of all dirt before another course is laid on top.

D.7.3.2.4 During inclement weather conditions, newly built brick masonry works shall be protected by tarpaulin or other suitable covering to prevent mortar being washed away by rain.

D.7.3.2.5 Brickwork shall be kept constantly moist on all the faces for at least seven days. The arrangement for curing shall be got approved from the Engineer.

D.7.3.2.6 Double scaffolding having two sets of vertical supports shall be provided to facilitate execution of the masonry works. The scaffolding shall be designed adequately considering all the dead, live and possible impact loads to ensure safety of the workmen, in accordance with the requirements stipulated in IS : 2750 and IS : 3696 (Part I). Scaffolding shall be properly maintained during the entire period of construction. Single scaffolding shall not be used on important works and will be permitted only in certain cases as decided by the Engineer. Where single scaffolding is adopted, only minimum number of holes, by omitting a header shall be left in the masonry for supporting horizontal scaffolding poles. All holes in the masonry shall be carefully made good before plastering / pointing.

- D.7.3.2.7 In the event of usage of traditional bricks of size 230 mm x 115 mm x 75 mm, the courses at the top of the plinth and sills as well as at the top of the wall just below the roof / floor slabs and at the top of the parapet shall be laid with bricks on edge.
- D.7.3.2.8 All brickwork shall be built tightly against columns, floor slabs or other structural members.
- D.7.3.2.9 To overcome the possibility of development of cracks in the brick masonry following measures shall be adopted.
- D.7.3.2.9.1 For resting RCC slabs, the bearing surface of masonry wall shall be finished on top with 12 mm thick cement mortar 1:3 and provided with 2 layers of Kraft paper grade 1 as per IS : 1397 or 2 layers of 50 micron thick polyethylene sheets.
- D.7.3.2.9.2 RCC/ steel beams resting on masonry wall shall be provided with plain or reinforced concrete bed blocks of dimensions as indicated in the drawings duly finished on top with 2 layers of Kraft paper Grade 1 as per IS : 1397 or 2 layers of 50 micron thick polyethylene sheets.
- D.7.3.2.9.3 Steel wire fabric shall be provided at the junction of brick masonry and concrete as specified elsewhere, before taking up plastering work. The above item shall be measured and paid for separately under the respective items of work.
- D.7.3.2.10 Bricks for partition walls shall be stacked adjacent to the structural member to pre-deflect the structural member before the wall is taken up for execution. Further, the top most course of half or full brick walls abutting against either a deshuttered slab or beam shall be built only after any proposed masonry wall above the structural member is executed to cater for the deflection of the structural element.
- D.7.3.2.11 Reinforced cement concrete transoms and mullions of dimensions as indicated in the construction drawings are generally required to be provided in half brick partition walls. Reinforced concrete for transoms and mullions shall be measured and paid for separately under the respective items of work.
- D.7.3.2.12 Where drawings indicate that structural steel sections are to be encased in brickwork, the brick masonry shall be built closely against the steel section, ensuring a minimum of 20 mm thick cement sand mortar 1:4 over all the steel surfaces. Steel sections partly embedded in brick work shall be provided with bituminous protective coating to the surfaces at the point of entry into the brick masonry.
- D.7.3.2.13 Contractor shall note that the unit rates quoted for the masonry work shall be deemed to include for the installation of miscellaneous inserts such as pipe sleeves, bolts, steel sections with anchors etc. and providing pockets, leaving openings, cutting chases etc. in accordance with the construction drawings. Miscellaneous inserts shall be either supplied free by the owner or to be furnished by the contractor. Any of the miscellaneous inserts which are required to be fabricated and supplied by the Contractor and cement concrete to be provide in the pockets for the hold fasts of door / window frames etc. shall however, be measured and paid for separately under the respective items of work.
- D.7.3.2.14 Facing bricks of the type specified conforming to IS: 2691 shall be laid in the positions indicated the drawings and all facing brickwork shall be well bonded to the backing bricks

/ RCC surfaces. The level of execution of the facing brick work shall at any time be lower by at least 600 mm. below the level of the backing brickwork.

D.7.3.2.15 Facing bricks shall be laid over 10 mm thick backing of cement mortar. The mortar mix, thickness of joint and the type of pointing to be carried out shall be as specified in the item of work. The pattern of laying the brick shall be as specifically indicated in the drawings.

D.7.3.2.16 For facing brickwork, double scaffolding shall be used.

D.7.3.2.17 Faced works shall be kept clean and free from damage, discoloration etc., at all times.

D.7.3.3 Measurement

D.7.3.3.1 Measurement shall be in cu.m. Correct to two places of decimal for brickwork of thickness one brick i.e. 200 mm/230 mm and above. Measurement shall be in sq.m. Correct to two places decimal for facing brickwork and brickwork of thickness half brick i.e. 100 mm / 115 mm and below. Measurement shall be for the quantities as actually executed duly deducting for openings, lintels, executed duly deducting for openings, lintels, transoms / mullions etc. All concrete works shall be measured and paid for separately under the respective items of work.

D.7.4 STEEL, DOORS, WINDOWS AND VENTILATORS

D.7.4.1 Materials

D.7.4.1.1 Hot rolled steel sections for the fabrication of steel, doors, windows and ventilators shall conform to IS: 7452, which are suitable for single glazing.

viii) Pressed steel door frames for steel flush doors shall be out of 1.25 mm thick mild steel sheets of profiles as per IS : 5437.

ix) Transparent sheet glass shall conform to the requirements of IS: 2835. Wired and figured glass shall be as per IS: 5437.

x) Builder's hardware of fittings and fixtures shall be of the best quality from approved manufacturers.

D.7.4.2 Workmanship

D.7.4.2.1 All steel doors, windows and ventilators shall be of the type as specified in the respective items of work and of sizes as indicated in the drawings. Steel doors, window and ventilators shall conform to the requirements as stipulated in IS: 1038. Steel windows shall conform to IS: 1361, if so specified.

D.7.4.2.2 Doors, windows and ventilators shall be of an approved manufacture. Fabrication of the units shall be with rolled section, cut to correct lengths and mitred. Corners shall be welded to form a solid fused welded joint conforming to the requirements of IS: 1038. Tolerance in overall dimensions shall be within ± 1.5 mm.

The frames and shutters shall be free from warp or buckle and shall be square and truly plane. All welds shall be dressed flush on exposed and contact surfaces. Punching of holes,

slots and other provisions to install fittings and fixtures later shall be made at the correct locations as per the requirements. Samples of the units shall be got approved by the ENGINEER before further manufacture / purchase by the CONTRACTOR.

- D.7.4.2.3 Type and details of shutters, hinges, glazing bar requirement, couplings, locking arrangement, fittings and fixtures shall be as described in the respective items of work and / or as shown in the drawings for single or composite units.
- D.7.4.2.4 For windows with fly proof mesh as per the item of work, rotor operator arrangement, for the operation of the glazed shutters from the inside shall be provided.
- D.7.4.2.5 Pressed steel door frames shall be provided with fixing lugs at each jamb, hinges, lock-strike plate, mortar guards, angle threshold, shock-absorbers of rubber or similar material as per the requirements of IS : 4351. Pressed steel door frames shall be fixed as 'built – in', as the masonry work proceeds. After placing it plumb at the specified location, masonry walls shall be built up solid on either side or each course grouted with mortar to ensure solid contact with the door frame, without leaving any voids. Temporary struts across the width shall be fixed, during erection to prevent bow / sag of the frame.
- D.7.4.2.6 Door shutters of flush welded construction shall be 45 mm thick, fabricated with two outer skins of 1.25 mm thick steel sheets, 1 mm thick steel sheet stiffeners and steel channels on all four edges. Double shutters shall have meeting stile edge beveled or rebated. Provision of glazed viewing panel, louvers shall be made as per the item of work and / or drawings. Shutters shall be suitably reinforced for lock and other surface hardware and to prevent sagging / twisting. Single sheet steel door shutters shall be fabricated out of 1.25 mm thick steel sheets, mild steel angles and stiffeners as per the drawings.
- D.7.4.2.7 Doors, windows and ventilators shall be fixed into the prepared openings. They shall not be 'built – in' as the masonry work proceeds, to avoid distortion and damage of the units. The dimensions of the masonry opening shall have 10 mm clearance around the overall dimensions of the frame for this purpose. Any support of scaffolding members on the frames / glazing bars is prohibited.
- D.7.4.2.8 Glazing of the units shall be either with flat transparent glass or wired / figured glass of the thickness as specified in the item of work. All glass panels shall have properly squared corner and straight edges. Glazing shall be provided on the outside of the frames.
- D.7.4.2.9 Fixing of the glazing shall be either with spring glazing clips and putty conforming to IS: 419 or with metal beads. Pre-formed PVC or rubber gaskets shall be provided for fixing the beads with concealed screws. The type of fixing the glazing shall be as indicated in the item of work and/or in drawings.
- D.7.4.2.10 Steel doors, windows and ventilators shall be provided with finish of either painting as specified or shall be hot dip galvanized with thickness of zinc coating as stipulated all as described in the respective items of work.
- D.7.4.2.11 The material of the Builders hardware of fittings and fixtures of chromium plated steel, cast brass, brass copper oxidized or anodized aluminum shall be as specified in the item of work. The number, size and type of fittings and fixtures shall be as in the bid drawings / item of work.

D.7.4.2.12 Installation of the units with fixing logs, screws, mastic caulking compound at the specified locations shall generally conform to the requirements of IS : 1081. Necessary holes etc. required for fixing shall be made by the CONTRACTOR and made good after installation. Workmanship expected is of a high order for efficient and smooth operation of the units.

D.7.4.3 Measurement

i) Measurement shall be in sq.m. correct to two places of decimal. Measurement shall be from out to out of the frames. Rates quoted shall be for the works including glazing, painting, builder's hardware of fittings and fixtures as specifically described in the respective items of work.

D.7.5 WATERSTOPS

D.7.5.1 Material

D.7.5.1.1 The material for the PVC water stops shall be a plastic compound with the basic resin of polyvinyl chloride and additional resins, plasticizers, inhibitors, which satisfies the performance characteristics specified below as per IS : 12200. Testing shall be in accordance with IS: 8543.

a) Tensile Strength	:	11.6 N/mm ² minimum
b) Ultimate elongation	:	300 % minimum
c) Tear Resistance	:	4.9 N/mm ² minimum
d) Stiffness in flexure	:	2.46 N/mm ² minimum
e) Accelerated extraction	:	
i) Tensile Strength	:	10.50 N/mm ² minimum
ii) Ultimate elongation	:	250% minimum
f) Effect of Alkali	:	7 days
i) Weight increase	:	0.10 % maximum
ii) Weight decrease	:	0.10 % maximum
iii) Hardness change	:	± 5 Points
g) Effect of Alkali	:	28 days
i) Weight increase	:	0.40 % maximum
ii) Weight decrease	:	0.30 % maximum
iii) Hardness change	:	± 1 Points

D.7.5.1.2 PVC water stops shall be either of the bar type, serrated with centre bulb and end grips for use within the concrete elements or of the surface (kicker) type for external use. The width, type, minimum thickness and safe hydraulic head requirements shall be as specified in the individual items of work.

D.7.5.1.3 PVC water stops shall be of approved manufacture, Samples and the test certificate shall be got approved by the ENGINEER before procurement for incorporation in the works.

D.7.5.2 Workmanship

D.7.5.2.1 Water stops shall be cleaned before placing them in position. Oil or grease shall be removed thoroughly using water and suitable detergents.

D.7.5.2.2 Water stops shall be procured in long lengths as manufactured to avoid joints as far as possible. Standard L or T type of intersection pieces shall be procured for use depending on their requirement. Any non-standard junctions shall be made by cutting the pieces to profile for jointing. Lapping of water stops shall not be permitted. All jointing shall be or fusion welded type as per manufacturer's instruction.

D.7.5.2.3 Water stops shall be placed at the correct location/ level and suitably supported at intervals with the reinforcement to ensure that it does not deviate from its intended position during concreting and vibrating. Care shall also be taken to ensure that no honey-combing occurs because of the serrations/end grips, by placing concrete with smaller size aggregates in this region. Projecting portions of the water stops embedded in concrete coating before resuming further concreting operations. The projecting water stop shall also be suitably supported at intervals with the reinforcement to maintain its intended position during concreting so as to ensure that it does not bend leading to formation of pockets. In addition, smaller size aggregates shall be used for concreting in this region also.

D.7.5.3 Measurement

D.7.5.3.1 Measurement shall be running meters correct to two places of decimal. No separate payment shall be made for joints or intersection pieces.

D.7.6 FIBER REINFORCED MANHOLE & COVER

The frame shall be fixed in cement concrete of M15 grade all around and finished with neat cement. The cover shall have a minimum thickness of 100 mm and weighing 78 kg. The fibers shall constitute 1% of the weight of the concrete in the form of 50 mm to 100 mm long high tensile steel wires. For the cover, MS sheet lapping of 3 gauge shall be provided to avoid damage to the edges. Similarly for frame, MS angle/flat shall be provided along the edge. Both MS sheet and angle shall be painted with black bituminous paint. The cover should have suitable lifting arrangement. The fiber reinforced frame and cover shall be manufactured as per the drawing approved by Owner/Engineer. The size, type, weight, and locking arrangement for frame and cover shall be as specified.

Mode of Measurement

The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item as described above. The rate shall be for a unit of one number basis.

D.7.7 INDIAN PATENT STONE FLOORING

D.7.7.1 Indian patent stone flooring shall be laid on concrete in two layers, an under bed of 44 mm thick and topping of 6 mm thick. Before placing the under bed any excess standing water shall be mopped out. The under bed shall consist of cement concrete with 20 mm down, clean, well graded, hard, approved stone chips and clean, sharp, coarse Band. The proportion of the mix shall be 1 part cement, 2 parts sand and 4 parts stone chips by volume. Waterproofing compound and chemicals, of approved make shall be added as per manufacturers' specifications, Water content shall be minimum. Just sufficient to give a workable consistency, which will allow a smooth finish to be obtained without excessive trowelling. Generally a water cement ratio of 0.4 should suffice. The floor shall be cast to required slope, in panels in a Chequered board sequence so that no two adjacent panels are cast before the contraction of the previous one has taken place. At least 48 hours

shall be allowed to pass after casting a panel before the adjacent panel is taken up for concreting. Individual panels shall not exceed 5 sq. meters in area and shall not have sides exceeding 2.5 meters. Edges of individual panels shall be supported by flat bars of steel or wood well-oiled to prevent sticking. These bars shall be removed before concreting the adjoining panels. The concrete of the new panel shall be well compacted against the edges of the previous panel. After laying, the under bed shall be leveled and compacted and brought to proper grade with a wooden screed or float.

D.7.7.2 A topping of 6 mm thickness of the same mix as the under bed shall be laid when the latter is still green and shall be trowelled smooth with a mixture of cement and sand in the proportion of 1:1 by volume. The under bed and the topping shall be completed in one operation. The topping shall be trowelled smooth to Engineer's satisfaction and all trowel marks mopped with a soft cloth to present a clean, even and smooth surface. Care shall be taken to see that DO footprints etc. are formed on the green topping surface during its laying, finishing and curing. The finished flooring shall be cured by ponding with water for a period of 7 days. The top surface shall be cleared of all dust and loose material and the Joints shall be filled with bitumen as directed by Engineer.

D.7.7.3 Indian patent stone flooring shall be measured in square meters.

D.7.8 DEMOLITION OF RCC WORK AND BRICK MASONARY WORK

D.7.8.1 The exiting RCC work and Brick masonry work is to be demolished step by step as per direction of site in charge. All serviceable and unserviceable materials like M. S. Cover, C. I. cowl, level indicator, valves, rods reinforcement steel recovered from demolished RCC Work, brick etc. should be stacked properly as per direction of site in charge. All the above demolished material will be property of AMC.
All unserviceable materials like broken limbs of RCC and Brick masonry should be carted at dumping site.

D.7.8.2 Measurement:

All demolition of RCC work and B.K. mass work will be paid on actual work done as per measurement on site on cmt. Basis. No separate payment will be made for stacking and carting serviceable material to AMC store. No separate payment for cutting reinforcement steel of demolished RCC work will be paid separately and the same should be stacked and Carted to AMC store at No cost.

All unserviceable material to be carted on dumping site will be paid under the item of earth carting. The payment will be on quantity of demolition work not on truck measurement.

D.7.8.3 MAKING HOLE AND LAYING CREEPING FLANGE IN EXISTING ESR AND IN EXISTING U/G SUMP WALL FOR INTER CONNECTION:

For laying of pipeline to interconnect old existing. Brick masonry / RCC / UG sump with new UG sump and laying inlet and outlet pipe in existing ESR, a hole should be made by demolishing BK masonry or RCC wall contractor with almost care to prevent any damage to structure of existing UG sump and ESR. If any damage occur that is to be carried out by contractor at his own cost.

After laying and jointing of pipeline within hole of UG sump and ESR, the gap in a hole outside of pipe shall be filled with c.c. with water proofing and early setting and quick hardening admixtures.

This job is to be completed by contractor by dry and night work with minimum interruption of daily water supply from the concern water distribution. Stations and so the job is to be considered time bound job by contractor. No specials item will be paid for this. The payment will be made on no. basis.

D.7.8.4 PVC DOORS:

Materials:

PVC doors shall be provided with EZ-7 section doorframe as mentioned in the item description. The size of the door shall be as per the drawing. The overall thickness of PVC doors shall be 24 mm. The aluminum fixtures and fastenings shall be fixed to the shutters as directed by the engineer-in-charge.

The doors shall be of Sintex or any other approved make.

Workmanship:

The holes for the hardware to be fitted shall be marked first on the door (for hinges, handle, tower bolt, aldop etc.); pilot holes of 3 mm shall be pre-drilled and then hinges is to be fitted on door. Screws shall not hammered on the door but fastened by hand / electric screw driver.

Mode of measurement:

The rates of the PVC doors shall be on the basis of area in sq.mt. of PVC doors procured and fixed by the contractor. No separate payment for the aluminum fixtures and fastenings shall be payable.

D.7.9 CEMENT PLASTER WORK

- D.7.9.1 All joints in masonry shall be raked to a depth of 12 mm with a hooked tool made for the purpose when the mortar is still green and in any case within 48 hours of it's laying. The surface to be rendered shall be washed with fresh clean water free from all dirt, loose plastering work is commended. Concrete surfaces to be rendered will however be kept dry. The wall should not too wet but only damp at the time of plastering. The damping shall be uniform to get uniform bond between the plaster and the wall.
- D.7.9.2 The proportion if the mortar shall be as specified under the respective items of work. Cement shall be mixed thoroughly in dry condition and then just enough water added to obtain a workable consistency. The quality of water, sand and cement shall be as per IS: Standards. The mortar thus mixed shall be used immediately and in no case shall the mortar be allowed to stand for more than 25 minutes after mixing with water.
- D.7.9.3 Curing of plaster shall be started as soon as the applied plaster has hardened enough so as not to be damaged. The decision, as to when the plaster has hardened, will be given by the

Engineer. Curing shall be done by continuous applying water in a spray and shall carry out for at least 7 days.

- D.7.9.4 Whenever the specifications or the item of work calls for water proofing, the Contractor shall provided the percentage of water proofing compound as specified in the items of work.
- D.7.9.5 Where lath plaster is specified, it shall be paid for at the same rate as for plasterwork without metal lath except that separate payment for metal lath will be made.
- D.7.9.6 Ceiling plaster shall be done before wall plaster and wall plaster shall commence at top and work downwards.
- D.7.9.7 **Interior plaster** - This plaster shall be laid in a two coats of 12 and 8 mm for 20 mm and single coat for 15 mm & 10 mm thickness. The mortar shall be dashed on the prepared surface with a trowel and finished smooth by trowelling on the surface with neeru (lime cream). Neeru shall be properly slaked fat lime. The standard of finish expected is high and shall conform to IS: 2394. Interior plaster shall be carried out on jambs, lintel and sill faces, top and undersides etc. as shown in the drawing or as directed by the Engineer. Rate quoted for plasterwork shall be deemed to include plastering of all those surfaces. However, if the item of work includes plaster finish, no separate payment would be made under 'plastering work'.
- D.7.9.7.1 **Exterior Plaster** – Exterior plasterwork shall be carried out in 2 layers. The first layer being 12 mm thick and the second layer being 8 mm thick. The first layer shall be dashed against the prepared surface with a trowel to obtain as even surface. The second layer shall then be applied and finished leaving as even and uniform surface, trowel finished unless otherwise directed by the Engineer.
- D.7.9.7.2 **Exterior Sand Faced Plaster** – The plaster shall be applied in 2 coats. The first coat or the scratch coat should be approximately 12 mm and shall be continuously carried be without break to the full length of wall or natural breaking points such as doors, windows etc. The scratch coat shall be dashed on the prepared surface with heavy pressure, brought to true and even surface and then lightly roughened by cross scratch lines, to provide bond for the finishing coat. The mortar proportion for this scratch coat shall be as specified in the respective item of work. The scratch coat shall be cured for at least 7 days and then allowed to dry.
- D.7.9.7.3 The second coat shall be 8 mm thick and it shall not be applied until at least 10 days have elapsed after the application of the scratch coat shall be evenly damped. This coat shall be applied from top to bottom in one operation and without joints, finish shall be straight, true and even. The mortar proportions of this coat shall be as specified under the respective item of work. Only approved white sand shall be used for the second coat and for finishing work. Sand for finish shall be used for the second coat and for finishing work. Sand for finish shall be even coarse size and shall be dashed on the surface and sponged.
- D.7.9.7.4 Wherever 32 mm thick plaster has been specified, this is intended for purpose of providing beading, bands etc. This work should be carried out in two or three layers and as directed by the Engineer.

D.7.9.7.5 In the case of pebble face finished plaster, pebbles of approved size and quality shall be dashed against the final surface to obtain as far as possible uniform pattern. In all cases, workmanship shall conform to IS: 1661.

D.7.9.8 Measurement

D.7.9.8.1 The quantity of work to be paid for under this item shall be calculated by taking the projected surface of the area plastered after making necessary deductions for opening, doors, windows, fan openings etc. The actual plasterwork carried out on jambs of doors, windows openings etc. shall be measured and added. However, for purposes of payment under this item, plaster work carried on surface of items of work, which include plaster finished, shall not be taken into account.

D.7.10 WATERPROOFING ADMIXTURES

D.7.10.1 If directed by the Engineer, the Contractor shall use approved waterproofing admixtures made by reputed manufacturer in the mortar for plasterwork. 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 specifically allowed by Engineer and shall conform to IS: 2645 with property of strong hydro phober and corrosion inhibitor. Dosage – 2% by weight of cement i.e. 1 kg per 50 kg bag of cement. Manufacturer must comply ISO – 9002 specifications. Payment shall be made for actual quantity of such admixture used unless it is already covered in the rates for the work concerned.

D.7.11 AIR VENTILATORS

D.7.11.1 Air ventilators shall be placed at such places as shown on drawing (the detailed drawing will be furnished during the execution of work) and as directed by the Engineer.

Cast Iron air ventilators shall have 610 mm height with 150 mm dia at bottom and a flange of 330 mm dia at top. A cast iron jali grating of 250 mm dia shall be placed and over it a cast iron cover of 460 mm dia having four legs of 50 mm square shall be bolted. The air ventilators shall be painted with two coats of anti-corrosive paint. The weight of the air ventilator shall be approximately 40 Kg.

D.7.11.2 Air ventilators shall be measured in numbers installed.

D.7.12 WATER LEVEL INDICATOR

D.7.12.1 Wooden water level indicator

Providing and fixing in position wooden gauge of approved size i.e. upto 225 mm wide and 2.5 cm thick with necessary iron framing of angles in perpendicular fashion with level indicator of as per the instruction of Engineer-in-charge and lettering. The lettering should be visible. The wooden gauge should be painted with 3 coats of synthetic enamel print of different colour as per the instructions. The iron angle frame and indicator should as per the instructions of Engineer-in-charge. The item should be paid on No.

D.7.12.2 Aluminum water level indicator

The float shall be made of S.S. and it shall be connected to pointer by stainless steel cord. The scale shall be so positioned that it shall be readable from MCC room. The scale shall be made of Aluminum and painted in white but small mark gradations with black. The pointer shall be painted red. The horizontal moment of the float shall be restricted by two guide wire ropes firmly anchored to the tank bottom and kept under permanent tension by spring tensioners. The level indicator shall be 6.5 m. high aluminum. The size and other details shall be as per drawing submitted by consultants at the time of execution.

Adequate support shall be provided to load at suitable position so that it will not sag.

D.7.13 POST AND PIPE RAILING

D.7.13.1 The pipe railing shall consist of vertical posts of IS MC-75 or 75 x 75 x 10 mm angle fixed in C. C. slab at 1.5 m. c/c as approved by the Engineer in charge. The mild steel girder of the required dimensions may also be used as directed by the Engineer in charge. The mild steel girder or channel shall be fixed to the R. C. C. slab at the ends by necessary bolts and nuts and in the approved manner as directed by the Engineer-in-charge. The length of the posts and their shape shall be as per standard drawings. Two rows of G. I. pipe 40 mm medium weight quality at 1.5 m. height with two rows of pipe, as railing will be provided. The quality of the pipes will be as approved by the Engineer in charge. The rate includes the cost of providing holes of required size in the posts and fixing the pipe railing with necessary couplings, bolt etc. in the slab. Two coats of Zinc paint over one coat of approved primer of approved quality will be applied to iron work as well as to structural work.

The rate shall be as per running length of the completed item of railing provided to the satisfaction of the Executive Engineer.

D.7.13.2 The rate includes the cost of structural steel as well as GI pipe of approved quality.

D.7.13.3 Painting letters with enameled paint for capacity of reservoir with size of letters 45 cm. height and 50 mm width etc. complete as directed.

D.7.13.4 The enameled paint shall be got approved from the Engineer in- charge. The size of letters shall be 45 cm high and 50 mm wide and shall be approved by the Engineer-in-charge. The rate includes necessary materials and labours etc. complete

D.7.13.5 Payment shall be made as job for complete item as specified.

D.7.14 Lightning Arrestor

D.7.14.1 Providing and installing copper lighting conductor system with necessary fixtures, material etc. complete as required and as directed.

D.7.14.2 Fixing copper lightning arrestor system including all carting charges to site, jointing materials, excavation, charcoal and salt filling, earth filling etc. complete, as required.

D.7.14.3 All such materials shall be got approved from the Engineer in charge before fixing the system.

D.7.14.4 Dimension of materials shall be as under:

- h) Copper strip type conductor 20 mm x 3 mm.
- i) Solid copper rod for air terminal 20 mm diameter 1.5 long with a knob at the end with a conical spike on the top.
- j) Suitable clamps to fix the conductor to the wall.
- k) Copper earth plate 6 mm thick and of 600 mm x 600 mm size.
- l) Earth terminal of 32 mm x 6 mm flat or 8 mm round copper wire.
- m) Charcoal, salt and sand for filling.
- n) Galvanized iron pipe of 4 m length shall be provided at G. L. for enclosing conductor or material required for lightening conductor.

D.7.14.5 Fixing

D.7.14.5.1 The air terminal shall be fixed vertically at the highest point of the structure and shall be 1.5 m long. The conductor top shall be attached to the upper terminal at the lower end double by reverting and soldering and shall be fixed along the building face from outside, most exposed to rain with suitable hold fast every 1.0 m or less. The conductor shall preferably in one pipe and shall be straight as far as possible. If required to be bend this straight length between the ends of bend shall be less than half the covered length. For a height of 3.0 m from the ground the conductor shall be enclosed in 50 mm dia. G. I. iron pipe secured to wall for protection from injury or theft. All metal surface ridges, roots, gutter etc. shall connect to the conductor with metal connection.

D.7.14.5.2 All joints in copper rod and tops besides being well cleaned with sand paper, screwed, scraped or riveted shall be soldered in addition. The lower extremity of the conductor shall be carried out to one m. under the ground.

Necessary trenches and pits shall be excavated for laying of the conductor and the copper plate. The strength shall be of suitable length and 1.0 m deep and sharp lead to a spot 5 to 6 mt. from the structure.

D.7.14.5.3 A copper top 25 mm x 8 mm shall then be riveted and soldered to the long end of the conductor and carried out along them in trench up to the spot, where the copper plate shall buried. The other end of the top shall connected to the copper earth plate by riveting and soldering.

D.7.14.5.4 All the joints from the upper including of the air terminal to the earth plate shall mechanically and electrically perfect.

D.7.14.5.5 The copper plate shall be as far as possible be buried, 60 cm to 1.0 m. below the sub soil water level in the dry season of the year. Where the permanent water level is deep. It is necessary to provide shell earths in trenches laid away in the building, the depth varying from 3 cm in clay soil to 60 cm. in sand or shingle through which the rain percolates more easily.

D.7.14.5.6 The earth plate shall be surrounded with, charcoal. The copper conductor shall be laid in charcoal and trench filled with sand and salt. The surface drainage shall be as far as possible be directed covers the trench.

D.7.14.6 Testing

D.7.14.6.1 The lightening arrestor shall be tested for the resistance by as suitable apparatus. The overall resistance of arrestors system from the top final to the earth in wet weather shall 1 to 2 hours. It shall never exceed 10 Ohms.

D.7.14.7 Mode of measurement and payment

D.7.14.7.1 Payment shall be made on number basis on acceptance by Engineer-in-charge.

D.7.15 PVC PIPES

(A) **Providing and supplying of standard lengths BIS marked rigid unplasticized PVC (UPVC) pipes with approved quality and brand of solvent cement coupler joints (including cost of solvent cement and one coupler with each pipe), conforming to IS : 4985 (latest edition) including freight, loading, unloading, stacking etc. complete.**

- p) 160 mm diameter pipe (OD) having test pressure of 4 Kg/cm²
- q) 50 mm diameter pipe (OD) having test pressure of 4 Kg/cm²

D.7.15.1 General

The pipes shall conform to IS- 4985-1988 or the latest edition of IS codes for unplasticized P. V. C. pipes for potable water supplies with BIS marks on each pipe.

The make of PVC pipe shall be any one of the following.

(1) Finolex (2) Dutron (3) Supreme

The details given below briefly cover the requirements for dimensions and tests for unplasticized P.V.C. pipes.

D.7.15.2 Composition

The materials from which the pipe is produced shall consist substantially of virgin polyvinyl chloride to which may be added only those additives that are needed to facilitate the manufacture of sound pipe of good surface finish, mechanical strength and opacity under conditions of use. **No other rework material shall be used.**

D.7.15.3 Dimensions

The outside diameter, the tolerance outside diameter and wall thickness of pipe shall be as per IS 4985 (Table No. 1).

D.7.15.4 Classification of Pipes

The pipes shall be suitable for the maximum test pressure of 4 Kg/cm².

D.7.15.5 Supply of Pipes, Couplers, Fittings, Solvent Cement

D.1.1 The pipes shall be supplied in straight lengths of 4, 5 & 6 meters with a tolerance of (+) 16 mm and (-) 0 mm.

D.1.2 The injection moulded couplers, specials, fittings etc. of relative diameter shall be supplied as per the requirement along with the pipe at no extra cost.

D.1.3 The solvent cement of **approved mark and manufacturer** shall be supplied as per standard consumption for each coupler joint, as well as for specials, fittings etc. as directed by the Engineer.

D.1.4 All the PVC pipes, couplers, fittings, specials shall be stacked in a **closed store** so as to protect them against ultra violet rays from sun as well as frequent changes in temperature.

D.7.15.6 Marking

Each pipe, coupler, specials, fittings etc. shall be indelibly marked at interval of not more than 3 meters in colour as indicated in Clause No. 10.1.1 of IS. The marking shall show the followings:-

- (g) The manufacturer's name or trade mark.
- (h) Outside diameter.
- (i) Maximum working pressure, batch number.
- (j) BIS certification marking.

(B) Lowering, laying and jointing PVC pipes and specials of following class and diameter except cost of PVC pipes and cement solvent, giving satisfactory hydraulic testing as per ISI code, etc. complete.

- The excavation for trenches will be done before laying of the pipes as per required depth and width so that adequate space can be made available for joint.
- Before laying, the pipes shall be brushed throughout the length so that the dust and soil can be removed.
- All the specials such as bends, tees, reducer, etc. shall be fixed as per instruction of engineer in charge in the pipeline.
- The pipe shall be hydraulically tested during the testing & no leakage shall be observed. If, leakage are observed, it will be set rightly by the contractor at his own cost as per the instruction of engineer in charge. 30% payment shall be made after hydraulic testing of pipeline.

The scope for the item cover:

Cost of additional excavation required for jointing clearing the site of all scrubs, bushes and trees and dewatering where necessary.

Labour for laying pipes in trenches to correct alignment at required depth with tools, including cutting of pipes and specials if required for laying of pipes including connecting pipes to specials and appurtenances.

Cost of the scaffolding, tools and plants, ropes etc.

Protection of existing works from damage and cost or repair to the damages carried out to the existing structure, sewer line telephone / electricity cables, electric cables, electric lines, gas pipe line, irrigation pipeline etc.

Labour for making joints including material for joints, tools as well as tests. Testing of pipes for leakage under water pressure and flushing the pipes after testing and construction work shall have to be arranged by the contractor at his own cost.

Method of measurement and payment:

The measurement shall be recorded in running meter of pipe length laid along the centerline of axis of pipeline for consolidated activities (a) & (b) including pipe material & specials if required. No payment shall be made for overlaps etc. 30% payment of this item shall be withheld for satisfactory hydraulic testing. The payment shall be made on running meter basis as per relevant item of schedule B of the tender.

D.7.16 BRICK MASONRY VALVE CHAMBER AND FLOW METER CHAMBER

- D.7.16.1 Second Class bricks of standards size shall be brought by the contractor and shall get approval before use in the work from the Engineer in Charge. The bricks work shall be carried out as per standard practice in C. M. 1:6 (1 cement: 6 coarse sand). Materials shall be as per relevant IS Specifications.
- D.7.16.2 13 mm thick cement plaster in CM 1:3 shall be provided all inside the wall and for outside above ground level. Materials shall be as per relevant IS Specifications.
- D.7.16.3 All the brick works shall be racked well before plastering and curing shall be done for atleast 7 days for plastering and 3 days for brick works.
- D.7.16.4 Cement pointing in C. M. 1:3 shall be done all outside below ground level.
- D.7.16.5 The precast RCC covers shall be in form of beams 150 mm thick and of appropriate width (maximum width 0.3 m.) with M20 concrete. The item is inclusive of HYSD bars for precast covers. The concreting shall be done according to relevant IS Specifications. The precast covers shall be well cured for atleast 28 days.
- D.7.16.6 **C. I. Rungs shall conforming to IS – 5455. These rungs shall be fixed staggered in two vertical runs, 300 mm apart horizontally and 300 mm c/c vertically. The top rung shall be 450 mm below the chamber cover and the lowest not more than 300 mm above the bottom of chamber.**
- D.7.16.7 The payment shall be made on number basis of completed item.

D.7.17 Precast cement concrete jali

This item relates to providing and fixing precast cement concrete jali of 50 mm thickness or specified in the item. Rate includes fixing the same jali in brick wall as per instructions. The size of jali shall be as per site condition. Work in general shall be carried out as per instructions on site and payment shall be made per smt.

D.7.18 Valve controlling rod

This item relates to providing and also for fixing of MS valve operating rod having 50 mm or 40 mm diameter as per the item specification. For operating valve on the top of valve rod a wheel should be provided. Extra cap at the bottom of MS rod should be provided as directed by Engineer-in-charge. Necessary hole should be made by the contractor in the roof slab of underground tank for this item and no extra shall be paid for it. This item also includes applying three coats of anti corrosive paint on MS rod and wheel. In short this item shall be carried out as per instruction of engineer in charge.

The payment shall be made on the number basis of actual numbers provided at site.

D.7.19 BITUMINOUS PAINT

D.7.19.1 General

The material shall be of the best quality unpigmented bituminous base paint of such a composition as to satisfy the requirements of IS:9862. The total volatile matter contained in the paint shall not exceed 55% by weight.

At least 95% of the solid materials shall be soluble in carbon disulphide or in benzene and the closed flash point as determined in Abel's apparatus shall not be less than 86°F (30°C). The paint shall remain liquid and retain its consistency at the ordinary atmospheric temperature when packed in suitable containers. The drying time shall not be less than 2 hours and not more than 8 hours and after drying, the paint shall not show any surface cracks, tendency to powder or discoloration due to weathering action or expansion and contraction, it shall also be able to resist the action of acids and alkalies. It shall not soften under the action of mineral turpentine.

D.7.19.2 Flexibility and Adhesion

The film resulting from brushing the material on a strip of tinned iron, 30 standard wire gauge after being allowed to dry at room temperature not below (65 °F) 18.3 °C for 48 hours shall not, when bent double over a (quarter inch) 6 mm dia rod, show any signs of flaking or cracking. The time occupied for the actual bending shall not exceed one second.

When the paint has dried hard, a 4H pencil should not be capable of scratching it. The weight of the paint shall be from 0.83 to 1.25 kg per litre, the component of the paint shall be such as not to react with water chlorinated or otherwise and develop poisonous or harmful elements thereto.

The paint shall be of Indian manufacture of approved make and quality.

D.7.19.3 Bituminous painting shall be measured in square meters.

D.7.20 BITUMEN KRAFT PAPER

D.7.20.1 The bitumen Kraft paper shall comprise of two plies of Kraft paper laminated with bitumen. It shall conform to type 1 of IS: 1398. It shall be free of cracks. The adhesion between the plies shall be such that they cannot be separated by pulling apart with hands

after conditioning as per Clause 2.1 of IS : 1060 part I without damaging the paper. Its minimum bursting strength should be 2.3 kgs/Sq.cms. Its tensile strength shall be as per IS: 1398.

D.7.20.2 Bitumen Kraft paper shall be measured in square metre.

D.7.21 100 mm x 100 mm size vata

It shall be done in the proportion mentioned in the item. Before starting the work of vata, proper watering shall be done. The vata shall be laid with the required thickness and leveled with wooden ruble. The vata shall be well compacted and the surface rubbed smooth with wooden trowel. Necessary watering for curing shall be made. Work shall be done with water proofing material as directed. The rate also includes the use of water proofing material 1 kg / 50 kg cement.

D.7.22 SHAHBAD/TANDUR/KOTA STONE FLOORING.

D.7.22.1 Stones, should be of approved quality, hard, durable and uniform thickness. Edges and top surface shall be chisel dressed with joints running true and parallel from side to side. Stones should be laid on a bed of cement mortar. Thickness of mortar bedding should not be less than 20 mm. The proportion of C.M. will be (1:5). For skirting base should be 12 mm thick and C.M. proportion will be (1:3). Before laying, the stone slabs should be thoroughly wetted with clean water. Neat cement should be spread over the mortar bed over as much area as could be covered with the slabs within half an hour. The slabs are then laid and gently tapped with wooden matter till it is firmly and properly bedded. These should be no hollows left. The joints should not be more than 2 mm thick. The joints should be struck smooth. The floor should be kept covered with damp sand or water for a week. Slabs should meet all the required properties and test requirements as stipulated in IS Code 1124.

D.7.23 Plastic moulded reinforced steps

D.7.23.1 Plastic moulded reinforced steps shall be as per IS 5455. The steps shall be of 8 mm TOR steel bar conforming to IS 1786 and Fe 415 grade with plastic polypropylene (P.P.) material (vergin).

Casting shall be of polypropylene conforming to an ASIM D 4101. The moulding shall be injection moulded.

D.7.24 Fiber Reinforced Concrete Frame and Cover

Fiber reinforced concrete frame and cover shall be as per item description load the frame shall be fixed in cement concrete of M20 grade all around and finished with neat cement. The fibres shall constitute 1% of the weight of the concrete in the form of 50 mm to 100 mm long high tensile steel wires. For the cover, MS sheet lapping of 16 gauge shall be provided to avoid damage to the edges. Similarly for frame, MS angle / flat shall be provided along the edge. Both MS sheet and angle shall be painted with black bituminous paint. The cover should have suitable lifting arrangement. The fibre reinforced frame and cover shall be manufactured as per the drawing approved by the Engineer-in-charge.

D-8: SUPPLY AND FABRICATION OF STRUCTURAL STEEL

SECTION: D-8

D.8.1 SCOPE

- D.8.1.1 This specification covers the general requirements for supply where specified, fabrication and delivery at site of structural steel. Section C covers the specific requirements for the project. The two parts are complementary and are to be read together for a correct interpretation of the provisions of this specification. Where requirements of the two parts conflict, those of Section C shall govern.
- D.8.1.2 This specification also covers design of all connections and substituted members, preparation of all shop fabrication drawings, inspection and shop painting of structures.

D.8.2 APPLICABLE CODES & SPECIFICATIONS:

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

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

a) Materials

- i) IS: 808 Dimensions for Hot Rolled Steel sections
- ii) IS: 814 Covered Electrodes for Manual Metal Arc Welding of Carbon And Carbon Manganese Steel
- iii) IS: 1161 Steel Tubes for structural purposes
- iv) IS: 1239 Mild steel tubes, tubular and other wrought steel fittings
Part 1 - Mild steel tubes
Part 2 - Mild steel Tubular and other wrought steel pipe fittings
- v) IS: 1363 Hexagon Head Bolts, Screws and Nuts of product
(Parts I to 3) Grade C (Size range M5 to M64)
- vi) IS: 1367 Technical Supply Conditions for Threaded Fasteners (All Parts)
- vii) IS: 1852 Rolling and Cutting Tolerances for Hot Rolled Steel Products.
- viii) IS: 1977 Structural Steel (Ordinary Quality)
- xi) IS: 2062 Steel for General Structural Purposes
- x) IS: 2074 Ready Mixed Paint, Air drying, Red Oxide Zinc Chrome and Priming

- xi) IS: 3502 Steel Chequered Plate
- xii) IS: 3757 High Strength Structural Bolts
- xiii) IS: 5369 General Requirements for Plain Washers and Lock Washers.
- xiv) IS: 5372 Taper Washers for Channels
- xv) IS: 5374 Taper Washers for Channels
- xvi) IS: 6610 Heavy Washers for Steel Structures
- xvii) IS: 8500 Structural Steel-micro alloyed (medium and high strength qualities)

b) Codes of Practice

- i) IS: 800 Code of Practice for General Construction in Steel
- ii) IS: 801 Code of practice for use of Cold formed light gauge steel structural members in general building construction.
- iii) IS: 803 Code of practice of design, fabrication and erection of vertical mild steel cylindrical welded storage tanks.
- iv) IS: 806 Code of practice for use of steel tubes in general building construction
- v) IS: 816 Code of practice for use for Metal Arc Welding for General construction in Mild Steel
- vi) IS: 822 Code of procedure for Inspection of Welds
- vii) IS: 1182 Recommended Practice for Radiographic examination of Fusion – Welded Butt Joints in Steel Plates.
- viii) IS: 1200 Method of Measurement in Building Civil Engineering Works.
- ix) IS: 1477 Code of practice for painting of (parts 1 & 2) Ferrous Metals in Buildings
- x) IS: 2595 Code of practice for Radiographic Testing
- xi) IS: 3658 Code of practice for Liquid Penetrant Flaw Detection
- xii) IS: 4000 High strength bolts in Steel Structures – Code of practice
- xiii) IS: 5334 Tolerance for Fabrication of Steel Structures

xv) IS: 9595 Recommendations for Metal Arc Welding of Carbon and Carbon manganese Steel

D.8.3 STEEL MATERIALS

Steel materials shall comply with the specifications laid down under clause 2.0 and/ or as called for on the design drawings.

All materials used shall be new, unused and free from defects.

Steel conforming to IS: 1977 shall be used only for the following:

Fe310 (St 32-0) : for general purposes such as door / window frames, grills, steel gates, handrails, fence posts, tee bars and other non-structural use.

Fe310 (St 32-0) : for structures not subjected to dynamic loading other than wind loads such as:
Platform roofs, foot over bridges, building, and factory sheds etc.

Fe4 10-0 (St 42-0): grade steel shall not be used

- a) If welding is to be employed for fabrication.
- b) If site is in severe earthquake zone.
- c) If plastic theory of design is used.

D.8.4 USE OF STEEL SUPPLIED BY THE PURCHASER

The VENDOR/CONTRACTOR shall use steel supplied by the PURCHASER judiciously and to the best advantage so as to minimise splicing and wastage. All steel materials remaining after completion of the report, whether in the form of balance pieces or unutilized prime steel, shall be returned to the PURCHASER'S stores by the VENDOR/CONTRACTOR at his own cost. An unaccountable wastage up to a maximum of 1% of the fabricated steel will be allowed. This wastage does not include the balance cut lengths/pieces of steel returned to the PURCHASER.

D.8.5 DRAWINGS PREPARED BY THE OWNER

D.8.5.1 Design drawings will be furnished to the VENDOR/CONTRACTOR and all drawings so furnished shall form a part of this specification. These design drawings prepared by the ENGINEER will show all the, levels, forces on members where shall necessary, size and orientation of each member, location/size of openings, to enable the VENDOR/CONTRACTOR to prepare drawings for fabrication and erection. It shall be clearly understood that these drawings are not intended to show connection details, thickness of members, cuts, notches, bends and such other details.

- D.8.5.2 The ENGINEER reserves the right to make changes. Revisions to drawings, even after release for preparation of shop drawings, are very likely to be made to reflect additional data/details received and updated requirements. Revisions to drawing and any new drawings made to include additional work by the VENDOR/CONTRACTOR shall be considered a part of this specification and contract. The PURCHASER shall not entertain any extra claims on this account.
- D.8.5.3 Where the fabrication drawings are to be furnished by the ENGINEER, he will issue to the VENDOR/CONTRACTOR the required copies of such drawings in the sequence required for the fabrication of the components in the order they will be required to be erected at site. Such drawings will be issued in such numbers as required for the VENDOR/CONTRACTOR to adhere to the project schedule.
- D.8.5.4 Should the VENDOR/CONTRACTOR during the execution of his work. Find discrepancies in the information furnished by the ENGINEER, he shall refer such discrepancies to the ENGINEER before proceeding with such work.

D.8.6 DRAWINGS PREPARED BY THE VENDOR/CONTRACTOR

- D.8.6.1 The VENDOR/CONTRACTOR shall prepare all fabrication and erection drawings for the entire work. All the drawings for the entire work shall be prepared in metric units, the drawings shall preferably be of one standard size and the details shown there in shall be clear and legible.
- D.8.6.2 The VENDOR/CONTRACTOR shall not commence detailing unless ENGINEER'S design drawings are officially released for preparation of shop drawings. The VENDOR/CONTRACTOR shall be responsible for the correctness of all fabrication drawings. Fabrication drawings shall be revised by the VENDOR/CONTRACTOR to reflect all revisions in design drawings as and when such revisions are made by the ENGINEER.
- D.8.6.3 All fabrication drawings shall be submitted to the ENGINEER for approval.
- D.8.6.4 No fabrication drawings will be accepted for ENGINEER'S approval unless checked and approved by the VENDOR/CONTRACTOR'S qualified structural engineer and accompanied by an erection plan showing the location of all pieces detailed. The VENDOR/CONTRACTOR shall ensure that connections are detailed to obtain ease in erection of structures and in making field connections.
- D.8.6.5 Fabrication shall be started by the VENDOR/CONTRACTOR only after ENGINEER'S approval of fabrication drawings. Approval by the ENGINEER of any of the drawings shall not relieve the VENDOR/CONTRACTOR from the responsibility for correctness of engineering & design of connections, workmanship, fit of parts, details, material, errors or omissions of any and all work shown thereon. The ENGINEER'S approval shall constitute approval of the size of members, dimensions and general arrangement but shall not constitute approval of the connections between members and other details.
- D.8.6.6 The drawings prepared by the VENDOR/CONTRACTOR and all subsequent revisions etc. shall be at the cost of the VENDOR/CONTRACTOR for which no separate payment will be made.

D.8.7 FABRICATION

D.8.7.1 General:

All workmanship and finish shall be of the best quality and shall conform to the best approved method of fabrication. All materials shall be finished straight and shall be machined/ground smooth true and square where so specified. All holes and edges shall be free of burrs. Shearing and chipping, shall be neatly and accurately done and all portions of work exposed to view shall be neatly finished. Unless otherwise directed/ approved, reference may be made to relevant IS codes for providing standard fabrication tolerance. Material at the shops shall be kept clean and protected from weather.

D.8.7.2 Connections:

D.8.7.2.1 Shop/field connections shall be as per approved fabrication drawings.

D.8.7.2.2 In case of bolted connections, taper washers or flat washers or spring washers shall be used with bolts as necessary. In case of high strength friction grip bolts, hardened washers be used under the nuts or the bolt heads whichever are turned to tighten the bolts. The length of the bolt shall be such that atleast one thread of the bolt projects beyond the nut, except incase of high strength friction grip bolts where this projection shall be atleast three times the pitch of the thread.

D.8.7.2.3 In all cases where bearing is critical, the unthreaded portion of bolt shall bear on the members assembled. A washer of adequate thickness may be provided to exclude the threads from the bearing thickness, if a longer grip bolt has to be used for this purpose.

D.8.7.2.4 All connections and splices shall be designed for full strength of members or loads indicated on ENGINEER'S design drawings. Column splices shall be designed for the full tensile strength of the minimum cross section at .the splice.

D.8.7.2.5 All bolts, nuts, washers, electrodes, screws etc. shall be supplied/brought to site 10% in excess of the requirement in each category and size. Rates shall cover the cost of this extra quantity.

D.8.7.2.6 All members likely to collect rainwater shall have drain holes provided.

D.8.7.3 Straightening:

All materials, shall be straight and, if necessary, before being worked shall be straightened and/or flattened by pressure and shall be free from twists. Heating or forging shall not be resorted to without the prior approval of the ENGINEER in writing.

D.8.7.4 Cutting, punching, drilling, welding and fabrication tolerances shall be generally as per relevant IS codes.

D.8.7.5 Rolling and Forming:

Plates, channels, R.S.J. etc. for circular bins, bunkers, hoppers, gantry girders, etc. shall be accurately laid off and rolled or formed to required profile/ shape as called for on the

drawings. Adjacent sections shall be match-marked to facilitate accurate assembly, welding and erection in the field.

D.8.7.6 High Strength Friction Grip Bolting:

- D.8.7.6.1 Inspection after tightening of bolts shall be carried out as stipulated in the appropriate standards depending upon the method of tightening and the type of bolt used.

D.8.7.7 Welding:

- D.8.7.7.1 Welding procedure shall be submitted to ENGINEER for approval. Welding shall be entrusted to only qualified and experienced welders who shall be periodically tested and graded as per IS: 817, IS: 7310 (Part 1) and IS: 7318 (Part 1).
- D.8.7.7.2 While fabricating plated beams and built up members, all shop splices in each component part shall be made before such component part is welded to other parts of the members. Wherever weld reinforcement interferes with proper fit-up between components to be assembled for welding, these welds shall be ground flush prior to assembly.
- D.8.7.7.3 Approval of the welding procedure by the ENGINEER shall not relieve the CONTRACTOR of his responsibility for correct and sound welding without undue distortion in the finished structure.
- D.8.7.7.4 No welding shall be done when the surface of the members is wet nor during periods of high wind.
- D.8.7.7.5 Each layer of a multiple layer weld except root and surfaces runs may be moderately peened with light blows from a blunt tool. Care shall be exercised to prevent scaling or flaking of weld and base metal from over peening.
- D.8.7.7.6 No welding shall be done on base metal at a temperature below - 5 Deg. C. Base metal shall be preheated to the temperature as per relevant IS codes.
- D.8.7.7.7 Electrodes other than low-hydrogen electrodes shall not be permitted thickness of 32 mm and above.

D.8.7.7.8 Inspection of Welds

All welds shall be inspected for flaws by any of the methods described under clause 8 "Inspection". The choice of the method adopted shall be determined by the PURCHASER/ENGINEER.

- D.8.7.7.9 The correction of defective welds shall be carried out as directed by the ENGINEER without damaging the parent metal. When a crack in the weld is removed, magnetic particle inspection or any other equally positive means as prescribed by the ENGINEER shall be used to ensure that the whole of the crack and material upto 25 mm beyond each end of the crack has been removed. Cost of all such tests and operations incidental to correction shall be to the VENDOR/CONTRACTOR'S account.

D.8.7.8 Tolerances

The dimensional and weight tolerances for rolled shapes shall be in accordance with IS: 1852 for indigenous steel and equivalent applicable codes for imported steel. The tolerances for fabrication of structural steel shall be as per IS: 7215.

D.8.7.9 End Milling

Where compression joints are specified to be designed for bearing, the bearing surface shall be milled true and square to ensure proper bearing and alignment.

D.8.8.1 INSPECTION:

D.8.8.1.1 The VENDOR/CONTRACTOR shall give due notice to the PURCHASER/ ENGINEER in advance of the works getting ready for inspection. All rejected material shall be promptly removed from the shop and replaced with new material for the PURCHASER'S/ ENGINEER'S approval/inspection. The fact that certain material has been accepted at the VENDOR/CONTRACTOR'S shop shall not invalidate final rejection at site by the PURCHASER/ENGINEER if it fails to conform to the requirements of these specifications, to be in proper condition or has fabrication inaccuracies which prevents proper assembly nor shall it invalidate any claim which the PURCHASER may make because of defective or unsatisfactory materials and/or workmanship.

D.8.8.1.2 No materials shall be painted or dispatched to site without inspection and by the PURCHASER/ ENGINEER unless such inspection is waived in writing by the ENGINEER.

D.8.8.1.3 The VENDOR/CONTRACTOR shall provide all the testing and inspection services and facilities for shop work except where otherwise specified.

D.8.8.1.4 For fabrication work carried out in the field the same standard of supervision and quality control shall be maintained as in shop fabricated work. Inspection and testing shall be conducted in a manner satisfactory to the Engineer.

D.8.8.2 Inspection and tests on structural steel members shall be as set forth below:

D.8.8.2.1 Material Testing

If mill test reports are not available for any steel materials the same shall be got tested by the VENDOR/CONTRACTOR to the ENGINEER'S satisfaction to demonstrate conformity with the relevant specification.

D.8.8.3 Tests on Welds

D.8.8.3.1 Magnetic Particle Test

Where welds are examined by magnetic particle testing, such testing shall be carried out in accordance with relevant IS codes. If heat treatment is performed, completed weld shall be examined after the heat treatment. All defects shall be repaired and re-tested. Magnetic particle tests shall be carried out using alternating current. Direct current may be used with the permission of the ENGINEER.

D.8.8.3.2 Liquid Penetrant Inspection

In the case of welds examined by Liquid Penetrant Inspection, such tests shall be carried out in accordance with relevant IS Code. All defects shown shall be repaired and rechecked.

D.8.8.3.3 Radiographic Inspection

All full strength butt welds shall be radiographed in accordance with the recommended practice for radiographic testing as per relevant IS code.

D.8.8.4 Dimensions, Workmanship & Cleanliness

Members shall be inspected at all stages of fabrication and assembly to verify that dimensions, tolerances, alignment, surface finish and painting are in accordance with the requirements shown in the VENDOR / CONTRACTOR's approved fabrication drawings and the ENGINEER's drawings.

D.8.8.5 Test Failure

In the event of failure of any member to satisfy inspection or test requirement, the CONTRACTOR shall notify the ENGINEER or his authorized representative. The VENDOR/CONTRACTOR must obtain permission from the ENGINEER before repair is undertaken. The quality control procedures to be followed to ensure satisfactory repair shall be subject to approval by the ENGINEER.

D.8.8.6 The ENGINEER has the right to specify additional testing as he deems necessary, and the additional cost of such testing shall be borne by the PURCHASER, only in case of successful testing.

D.8.8.7 The VENDOR/CONTRACTOR shall maintain records of all inspection and testing which shall be made available to the ENGINEER or his authorized representative.

D.8.9 SHOP MATCHING:

For structures like bunkers, tanks, etc. shop assembly is essential. For other steelwork, such as columns along with the tie beams/bracings may have to be shop assembled to ensure satisfactory fabrication, obtaining of adequate bearing areas etc. if so desired by the ENGINEER. All these shop assemblies shall be came out by VENDOR/CONTRACTOR at no extra cost to the PURCHASER.

D.8.10 DRILLING HOLES FOR OTHER WORKS:

As a part of this Contract, holes in members required for installing equipment or steel furnished by other manufacturers or other contractors shall be drilled by the VENDOR/CONTRACTOR at no extra cost to the PURCHASER. The information for such extra holes will be supplied by the PURCHASER/ ENGINEER.

D.8.11 MARKING OF MEMBERS:

D.8.11.1 After checking and inspection, all members shall be marked for identification during erection. This mark shall correspond to distinguishing marks on approved erection drawings and shall be legibly painted and stamped on it. The erection mark shall be

stamped with a metal dye with figures at least 20 mm high and to such optimum depth as to be clearly visible.

D.8.11.2 All erection marks shall be on the outer surface of all sections and near one end, but clear of bolt holes. The marking shall be so stamped that they are easily discernible when sorting out members. The stamped marking shall be encircled boldly by a distinguishable paint to facilitate easy location.

D.8.11.3 Erection marks on like pieces shall be in identical locations. Members having lengths of 7.0 m or more shall have the erection mark at both ends.

D.8.12 ERRORS

Any error in shop fabrication which prevents proper assembling and fitting up of parts in the field by moderate use of drift pins or moderate amount of reaming will be classified by the ENGINEER as defective workmanship. In case ENGINEER rejects such material or defective workmanship, the same shall be replaced by the materials and workmanship conforming to the ENGINEER'S requirements by VENDOR/ CONTRACTOR free of cost at site.

D.8.13 PAINTING

All fabricated steel material, except those galvanized shall receive protective paint coating as specified in specification.

D.8.14 METHOD OF MEASUREMENT

D.8.14.1 For the purpose of payment, the weight of the actual completed structures shall be calculated from the approved drawings for different items of work. The VENDOR/ CONTRACTOR shall submit to the PURCHASER relevant material list containing weight of each item.

D.8.14.2 No allowances will be permitted for bolts, nuts, washers, studs, screws etc, galvanizing, welding or for rolling margins. One tonne for the purpose of payment shall mean ONE METRIC TONNE i.e. 1000 Kg.

D.8.14.3 The weight of a member made out of standard rolled section such as beams, channels, angles, etc. shall be based on the standard IS: 808 without deductions for holes, notches, bevel cuts, etc. Where a component consists of a cut joist or channels, the full weight of the rolled section shall be considered only if more than half the depth of the original section is used. Otherwise, only half the section unit weight shall be considered for calculation of the weight of the components. Deduction shall be made in the weight of gussets /plates of cuts and notches of 900 sq.cm or larger.

D.8.14.4 For gussets / plates used in trusses, bracings, columns, beams, etc, the area shall be that of the minimum circumscribing rectangle except as stated in 14.3 above.

D.8.14.5 The weight of any built-up members shall be based on the weight of each component.

D-9: C.I. & D.I. PIPES, VALVES AND FITTINGS

SECTION: D-9

D.9.1 CAST IRON PIPES

D.9.1.1 SCOPE

D.9.1.1.1 This specification covers the requirements for manufacturing, testing, supplying, jointing and testing at work sites of cast iron pipes and fittings used for water supply and sewerage system.

D.9.1.2 APPLICABLE CODES

D.9.1.2.1 The manufacturing, testing, supplying, jointing and testing at work sites of cast iron pipes and fittings shall comply with all currently applicable statutes, regulations, standards and codes. In particular, the following standards, unless otherwise specified herein, shall be referred. In all cases, the latest revision of the codes shall be referred to. If requirements of this specification conflict with the requirements of the codes standards, this specification shall govern.

D.9.1.2.2 Materials

- | | | | |
|----|----------|---|--|
| a) | IS: 210 | : | Specification for grey iron casting |
| b) | IS: 290 | : | Specification for coal tar black paint. |
| c) | IS: 638 | : | Specification for sheet rubber jointing and rubber insertion jointing |
| d) | IS: 782 | : | Specification for caulking lead |
| e) | IS: 1387 | : | General requirements for the supply of metallurgical material. |
| f) | IS: 1537 | : | Specification for vertically cast iron pressure pipes for water, gas and sewage. |
| g) | IS: 1536 | : | Specification for centrifugally cast (spun) iron pressure pipes for water, gas and sewage. |
| h) | IS: 1538 | : | Specification for cast iron fittings for pressure pipes for water, gas and sewage. |
| i) | IS: 1500 | : | Method for Brinnell hardness test for grey cast iron. |
| j) | IS: 2078 | : | Method for tensile testing of grey cast iron. |
| k) | IS: 5382 | : | Specification for rubber sealing rings for gas mains, water mains and sewers |
| l) | IS: 6587 | : | Specification for spun hemp yarn. |

D.9.1.2.3 Code of Practice

- | | | | |
|----|----------|---|---|
| a) | IS: 3114 | : | Code of practice for laying of cast iron pipes. |
|----|----------|---|---|

D.9.1.2.4 MANUFACTURE

- D.9.1.2.4.1 The metal used for the manufacture of pipes shall be good quality cast iron. It shall be prepared, at the discretion of the manufacturer, in a cupola or an active mixer or other suitable furnace.
- D.9.1.2.4.2 The pipes shall be stripped with all precautions necessary to avoid warping or shrinkage defects. The pipes shall be free from defects, other than any unavoidable surface imperfections which result from the method of manufacture and which do not affect the serviceability of the pipes. By agreement between the purchaser and the manufacturer, minor defects may be rectified.
- D.9.1.2.4.3 The pipes shall be such that they could be cut, drilled or machined. Pipes shall be accepted provided the hardness of the external unmachined surface does not exceed Brinell hardness of 230 HB.
- D.9.1.2.4.4 Spun pipes shall be subjected to heat treatment, if necessary, to ensure that the Brinell hardness does not exceed the limit specified.
- D.9.1.2.4.5 In case of rubber joints, the spigot ends shall be suitably chamfered for smooth entry of pipe in the socket fitted with the rubber gasket.
- D.9.1.2.4.6 In case of flanged pipes, the flanges shall be at right angles to the axis of the pipe and machined on face. The bolt holes shall be drilled.
- D.9.1.2.4.7 The bolt hole circle shall be concentric with the bore, and the two flanges of the pipe shall be correctly aligned.
- D.9.1.2.4.8 Cast iron pipes having screwed-on-flanges shall be sealed at the threaded joint between the pipes and the flange by a suitable sealing compound. Unless otherwise specified, the sealing compound applied to the threaded joint shall be suitable for use with 'raw' and potable water (upto a temperature of 100⁰ C), gas normal domestic sewage.
- D.9.1.2.4.9 Alternative types of sealing compound for pipes used for other duties, such as the carrying of industrial effluents or chemicals shall be the subject of agreement between the manufacturer and the purchaser.
- D.9.1.2.4.10 For flanged pipes, only Class A and Class B (see 9.1 and Tables 9 and 10) pipes with screwed flanges have been covered. The method of screwing and the exact form of the thread are left to the discretion of the manufacturer in view of the fact that the flanges are never removed after screwing on the barrels of the pipes.

D.9.1.3 MECHANICAL TESTS

- D.9.1.3.1 Mechanical tests shall be carried out during manufacture. Test for every four hours of production shall be conducted. The results obtained shall be taken to represent all the pipes of all sizes made during that period as per **IS: 1536 – 1976**

D.9.1.4 TESTS

D.9.1.4.1 Two test pieces obtained by cutting rings or bars from the spigot end of two pipes selected for testing, when tested in accordance with the methods specified in Appendix A, shall satisfy the following requirements.

(a) Ring Test (for pipes Centrifugally Cast in Metal Moulds):

Nominal Diameter	Modulus of Rupture, Min N/ mm² (Kgf/mm²)
Up to and including 300 mm	390 (40)

(b) Tensile Test

Sr. No.	Type of Moulding	Nominal Diameter	Tensile Strength, Min N/mm² (Kgf/mm²)
1	For pipes centrifugally cast in metal moulds	Over 300 mm and up to and including 600 mm	200 (20)
		Over 600 mm	180 (18)
2	For pipes centrifugally cast in sand moulds	All diameters	180 (18)

All pipes from which rings or bars have been cut shall be accepted by the purchaser as complete lengths.

D.9.1.5 BRINELL HARDNESS TEST

D.9.1.5.1 For checking the Brinnell hardness specified in 4.3 the test shall be carried out on the test rings of bars cut from the pipes used for tests under 5.1, in accordance with IS : 1789-1961. The test shall be carried out by applying either a load of 3000 Kg to a ball of 10 mm diameter for 15 seconds, or a load of 750 Kg to a ball of 5 mm diameter for 10 seconds.

D.9.1.6 RETESTS

D.9.1.6.1 If any test piece representing a lot fails in the first instance, two additional tests shall be made on test pieces selected from two other pipes from the same lot. If both the test results satisfy the specified requirements, the lot shall be accepted. Should either of these additional test pieces fail, the lot shall be deemed as not complying with this standard.

D.9.1.7 HYDROSTATIC TEST

- D.9.1.7.1 For hydrostatic test, all pipes shall be kept under pressure for 15 seconds; they may be struck moderately with a 700-g hammer. They shall withstand the pressure test without showing any leakage, sweating or other defect of any kind. As far as possible the hydrostatic test shall be conducted before coating the pipes.

D.9.1.8 WORKS TEST REQUIREMENTS

- D.9.1.8.1 All pipes shall withstand hydrostatic test pressures specified under col. 2 of Tables 1 and 2.

D.9.1.9 INSTALLATION TEST REQUIREMENTS

- D.9.1.9.1 All pipes shall withstand hydrostatic test pressures specified under col. 3 of Tables 1 and 2.
- D.9.1.9.2 When pipes are required for higher test pressures, test pressures are subject to special agreement between the purchaser and the manufacturer.

D.9.1.10 SIZES

- D.9.1.10.1 The dimensions of pipes, sockets, spigots and flanges shall conform to the sizes specified in Tables 3 to 10.

TABLE – 1
HYDROSTATIC TEST PRESSURES FOR CENTRIFUGALLY
CAST SOCKET AND SPIGOT PIPES

Class	Hydrostatic test pressure at works N/mm² (Kgf/cm²)	Maximum hydrostatic test pressure after installation N/mm² (Kgf/cm²)
LA	3.5 (35)	1.2 (12)
A	3.5 (35)	1.8 (18)
B	3.5 (35)	2.4 (24)

TABLE – 2
HYDROSTATIC TEST PRESSURES FOR CENTRIFUGALLY
CAST FLANGED PIPES (UPTO 600 MM DIAMETER)

Class	Hydrostatic test pressure at works N/mm² (Kgf/cm²)	Maximum hydrostatic test pressure after installation N/mm² (Kgf/cm²)
A	3.5 (35)	1.8 (18)
B	3.5 (35)	2.4 (24)

D.9.1.11 TOLERANCE

- D.9.1.11.1 Tolerance on External Diameter of the Barrel, the Internal Diameter of the socket and the Depth of the socket: The tolerance for lead jointing shall be as follows:-

Sr. No.	Dimensions	Nominal Diameter (DN)	Tolerance mm
a)	External diameter of barrel (DE)	All diameters	$\pm \frac{1}{2} f = \pm (4.5 + 0.0015 \text{ DN})$
b)	Internal diameter of socket (DI)	All diameters	$\pm \frac{1}{2} f = \pm (3 \pm 0.001 \text{ DN})$
c)	Depth of socket (P)	1) Upto and including 600 mm 2) Over 600 mm and upto and including 1000 mm	± 5 ± 10

NOTE 1: It is the caulking space of the joint in millimeters and is equal to $9 + 0.003 \text{ DN}$.

2: The jointing tolerances applicable to rubber joints (mechanical or push in joints) shall be as specified by their manufacturer and shall be within the tolerance specified above.

3. The maximum or minimum jointing space resulting from these tolerances is such that the jointing of the pipes and fittings is not adversely affected.

D.9.1.12 TOLERANCE ON THICKNESS

D.9.1.12.1 The tolerance on the wall thickness and flange thickness of pipes shall be as follows:-

Sr. No.	Dimension	Tolerance in mm
a)	Wall thickness	$-(1 + 0.05 e)^*$
b)	Flange thickness	$\pm (2 + 0.05 b)$

Where e is the thickness of the wall in millimeters, and b is the thickness of the flange in millimeters.

D.9.1.13 TOLERANCE ON LENGTH

D.9.1.13.1 The tolerance on length of pipes shall be as follows:-

Sr. No.	Type of Casting	Tolerance in mm
a)	Wall thickness	± 25
b)	Flanged pipes	± 10

Of the total number of socket and spigot pipes to be supplied in each diameter, the manufacturer may supply upto 10 percent in lengths shorter than the specified length as follows:-

Specified Length	Decrease in Length
Upto 4 m	0.5, 1 m.
Over 4 m	0.5, 1, 1.5, 2 m.

D.9.1.14 PERMISSIBLE DEVIATION FROM A STRAIGHT LINE

- D.9.1.14.1 The pipes shall be straight. When rolled along two gantries separated by approximately two thirds the length of the pipe to be checked, the maximum deviation fm in millimeters shall not be greater than 1.25 times the length l in meters of this pipe, thus $fm \leq 1.25 l$.

D.9.1.15 MASS

- D.9.1.15.1 The standard masses of uncoated pipes shall be those given in tables 3 to 10. The masses have been calculated, for the lengths generally used, by taking into account in each case the mass of socket or flange fixed arbitrarily as a proportion of the mass of the pipe barrel. For this purpose the density of cast iron has been taken as 7.15 Kg/cm^2 .
- D.9.1.15.2 The permissible tolerances on standard mass of pipe shall be ± 5 percent.
- D.9.1.15.3 If mutually agreed upon, pipes of a heavier mass than the maximum may be accepted, provided they comply in every other respect with the requirements of this standard.

D.9.1.16 COATING

- D.9.1.16.1 Each pipe shall be coated as given under 12.2 to 12.7.
- D.9.1.16.2 Coating shall not be applied to any pipe unless its surfaces are clean, dry and free from rust.
- D.9.1.16.3 Except when otherwise agreed to between the purchaser and the manufacturer, all pipes shall be coated externally and internally with the same material, the pipes being heated prior to total immersion in a bath containing a uniformly heated composition having a tar of other suitable base.
- D.9.1.16.4 The coating material shall set rapidly with good adherence and shall not scale off.
- D.9.1.16.5 In all instances where the coating material has a tar or similar base, it shall be smooth and tenacious and hard enough not to flow when exposed to a temperature of 77°C but not so brittle at a temperature of 0°C as to chip off when scribed lightly with a penknife.
- D.9.1.16.6 When the pipes are to be used for conveying potable water, the inside coating shall not contain any constituent soluble in such water or any ingredient which could impart any taste of odour whatsoever to the potable water after sterilization and suitable washing of the mains.

- D.9.1.16.7 In the case of pipes (wholly or partially coated) which are imperfectly coated or where the coating does not set or conform to the required quality, the coating shall be removed and the pipes recorded.

D.9.1.17 MARKING

- D.9.1.17.1 Each pipe shall have cast, stamped or indelibly painted on it the following appropriate marks.

- a) Manufacturer's name, initials or identifications mark;
- b) The nominal diameter;
- c) Class reference;
- d) Mass of pipe;
- e) The number of this Indian Standard; and
- f) The last two digits of the year of manufacture.

D.9.1.18 MARKING MAY BE DONE

- A) On the socket faces of pipe centrifugally cast in metal moulds, and
- B) On the outside of the socket or on the barrel of pipe centrifugally cast in sand mould.

- D.9.1.18.1 Any other marks required by the purchaser may be painted on.

- D.9.1.18.2 The pipes may also be marked with the ISI Certification Mark.

D.9.1.19 JOINTING

D.9.1.19.1 General

Jointing of CI pipes and fittings shall be done as per the requirements of the following specifications and as per the relevant IS. The type of joints shall be as per specific item. After jointing, extraneous material, if any, shall be removed from the inside of the pipe. In case, rubber sealing rings are used for jointing, these shall conform to IS: 5382 and shall be of such type as mentioned in specific item.

D.9.1.19.2 Lead Joints

The jointing shall be done with molten lead and spun yarn, Pig lead shall be of uniform quality, clean and free from foreign materials. It shall be of uniform softness and capable of being easily caulked or driven. It shall conform to IS: 782. Spun yarn shall be of clean hemp and of good quality. It shall conform to IS: 6587. The quantity of lead to be used for jointing of different diameters of CI pipes and fittings shall be as per table 1 of IS: 3114.

Lead shall be heated in a melting pot kept in easy reach of the joint to be poured so that the molten metal will not be chilled in being carried from the melting pot to the joint and shall be brought to a proper temperature so that when stirred it will show a rapid change of colour. Before pouring, all scum shall be removed. Each joint shall be

made with a continuous pour filling of the entire joint space with solid lead. Spongy or immediately filled joints shall be burnt out and repoured.

The joint runner shall fit snugly against the face of the socket and the outside of the pipe shall be dammed with clay to form a pouring lip to provide for filling the joint flush with the face and to the top of the socket.

The jointing is done by first caulking in spun yarn, then filling the remainder of the joint space by running in molten lead, taking care that no dross enters the joint, and then thoroughly caulking the lead. The spun yarn shall be used to center the spigot in the socket and to prevent the flow of molten lead into the bore of the pipe. The spun yarn shall be effectively disinfected before use.

After the lead has been run into the lead shall be thoroughly caulked. Caulking of joints shall be done after a convenient length of the pipe has been laid and leaded. The leading ring shall first be removed with a flat chisel and then the joint caulked around three times with caulking tools of increasing thickness and hammer of 2 Kg. weight. Lead run joints shall be preferably finished 3 mm behind the socket face. The joints shall not be covered till the pipeline has been tested under specified hydrostatic test pressure, though the rest of the pipe line should be covered up to prevent expansion and contraction due to variation in temperature.

The quantity of lead required for different sizes of pipes shall be as follows:

QUANTITY OF LEAD FOR DIFFERENT SIZES OF PIPES

Nominal size of pipe mm.	Lead / joint Kg.	Depth of lead joint mm
(1)	(2)	(3)
80	1.8	45
100	2.2	45
125	2.6	45
150	3.4	50
200	5.0	50
300	7.2	55
350	8.4	55
400	9.5	55
450	14.0	55
500	15	60
600	19.0	60
700	22.0	60
750	25.0	60
800	31.5	65
900	35.0	65
1000	41.0	65
1100	46.0	65
1200	52.0	70
1500	66.5	75

In case of wet condition the jointing shall be done by lead wool and spun yarn. The quantity of lead wool and spun yarn required for different sizes of pipes shall be as follows.

QUANTITY OF LEAD WOOL AND SPUN YARN FOR DIFFERENT SIZES OF PIPES / JOINT

Nominal Internal Diameter mm.	Lead wool weight Kg.	Spun yarn weight Kg.
(1)	(2)	(3)
80	1.30	0.17
100	1.70	0.23
150	2.41	0.34
175	2.89	0.37
200	3.37	0.57
225	3.63	0.64
250	4.11	0.74
300	4.82	0.82
350	6.04	1.17
375	6.52	1.25
400	7.00	1.33
450	9.64	1.84
500	10.86	1.99
600	12.79	2.83
750	15.68	3.52
825	17.12	3.88
900	18.80	4.25
1200	28.44	6.01

D.9.1.19.3 Tyton Joints

In jointing Cast iron spigot and socket pipes and fittings with Tyton flexible joints the contractor shall take into account the manufacturer's recommendations as to the methods and equipment to be used in assembling the joints. In particular the Contractor shall ensure that the spigot end of the pipe to be jointed is smooth and has been properly chamfered, that the rubber ring as per IS: 5382, is correctly positioned in line before the joint is made. The rubber rings and any recommended lubricant shall be obtained only through the pipe supplier or as otherwise directed by Engineer.

D.9.1.19.4 Cement Joints

Where cement joints are used for cast iron gravity sewers, cement as permitted in IS: 456 shall be used.

Closely twisted spun yarn gasket for such diameter as required to support the spigot of the pipe at the proper grade and make truly concentric joints, and in one piece of sufficient length to pass around the pipe and lap at the top, shall be thoroughly saturated in cement paste. This gasket shall be laid in the socket for the lower third of the circumference of the joint and covered with cement mortar (1 cement: 1 coarse sand). The spigot of the pipe shall be thoroughly cleaned with a wet brush, inserted

and carefully driven home, after which a small amount of mortar shall be inserted in the annular space around the entire circumference of the pipe and solidly rammed into the joint with a caulking tool, the mortar previously place being driven ahead of the gasket. The remainder of the joint shall then be completely filled with mortar and beveled off at an angle of 45 degrees with the outside of the pipe. On pipes 450 mm in diameter or larger, the joints shall be pointed and smoothened from the inside. While making cement joints, one lead joint shall be introduced for every ten cement joints.

The inside of the pipe shall be cleaned after the mortar sets slightly by dragging a large gunny-wrapped block of wood or straw through the pipe. Care is however, necessary to see that this block is not left in the sewer when the work is interrupted or completed.

Pipes laid with cement joints shall not be filled with water until a lapse of twelve hours after the last joint in any valve section has been made. The pressure shall not be permitted in the pipe until all joints have been properly cured.

D.9.1.19.5 Flanged Joints

The gaskets used between flanges of pipes shall be compressed fibre board or natural / synthetic rubber confirming to IS: 638 of thickness between 1.5 to 3 mm. The fiber board shall be impregnated with chemically natural mineral oil and shall have a smooth and hard surface. Its weight per square metre shall be not less than 112 g/mm thickness.

Each bolt should be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively. The practice of fully tightening the bolts one after another is highly undesirable. The bolts shall be of mild steel unless otherwise specified.

D.9.1.19.6 Cleaning of Pipes and Fittings

Contractor shall ascertain that each stretch of pipeline is absolutely clear and without any obstruction by means of visual examination of the interior of pipeline suitably lighted by projected sunlight or otherwise. The open end of an incomplete stretch of pipeline shall be securely closed as may be directed by Owner / Engineer to prevent entry of mud or site etc.

If as a result of the removal of any obstructions Owner / Engineer considers that damages may have been caused to the pipeline. He shall be entitled to order the stretch to be tested immediately. Should such test prove unsatisfactory, contractor shall amend the work and carry out such further tests as are required by Owner/Engineer.

D.9.1.19.7 Testing at Work Site

After the pipes and fittings are laid, jointed and the trench partially back filled except at the joins the stretch of pipeline as directed by Engineer shall be subjected to pressure test and leakage test. Where any section of the pipe line is provided with concrete thrust block or anchorages, the pressure test shall not be made until at least five days have elapsed after the concrete was cast. If rapid hardening cement has been used in these blocks or anchorages, the tests shall not be made until at least two days have elapsed.

Each section of the pipe line shall be slowly filled with water and all air shall be expelled from the pipe by tapping at points of highest elevation before the test is made and lugs inserted after the tests have been completed. The specified test pressure as per items, based on the elevation of the lowest point of the line of section under corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipes as directed by Engineer.

The duration of tests shall not be less than 5 minutes. The exposed joints shall be carefully examined and all such joints showing visible leaks shall be recaulked until water tight. Any cracked or defective pipes and fittings in consequence of this pressure test shall be removed and replaced by sound material by contractor at no extra cost to Owner / Engineer and the test shall be repeated to the satisfaction of Owner/Engineer.

After the satisfactory completion of pressure test, the section of pipeline shall be subjected to leakage test at a pressure as specified in item. The duration of test shall be 2 hours. No pipe installation shall be accepted until the leakage is less than the number of cm³/h as determined by the formula:

$$Q_t = \frac{ND(P)^{1/2}}{3.3}$$

Where =

Q_t = the allowable leakage in cm³/h
 N = number of joints in the length of the pipeline
 D = Diameter in mm, and
 P = the average test pressure during the leakage test in Kg/cm².

Should any test of pipe laid indicate leakage greater than that specified above, the defective joints shall be repaired by contractor at no extra cost to Owner / Engineer until the leakage is within the specified allowance.

Necessary equipment and water used for testing shall be arranged by contractor at his own cost. Damage during testing shall be contractor's responsibility and shall be rectified by him at no extra cost to Owner/Engineer. Water used for testing shall be removed from the pipe and not released in the excavated trenches.

After the tests mentioned above are completed to the satisfaction of Owner/Engineer, the backfilling of trenches shall be done as per specification given in Section: D1.

D.9.1.19.8 Disinfection of Water Mains

The mains intended for potable water supplies should be disinfected before commissioning them for use.

After pressure testing the main, it should be flushed with water of sufficient velocity to remove all dirt and other foreign materials. When this process has been completed, disinfection (during liquid chlorine, sodium or calcium hypochlorite) can proceed by one of the following methods.

Continuous Feed

In this method, water from the distribution system or other approved source and the chlorine are fed at constant rate into the newly laid main at a concentration of at least 20 to 50 mg/l. A properly adjusted hypochlorite solution injected into the main with a hypochlorinator, or liquid chlorine injected into the main through a solution feed chlorinator and booster pump shall be used. The chlorine residual should be checked at intervals to ensure that the proper level is maintained. Chlorine application should continue until the entire main is filled. The water should remain in the main for a minimum of 24 hours. During which time all valves, hydrants, etc. along the main should be operated to ensure their proper disinfection. Following the 24 hours period, not less than 10 mg/l chlorine residual should remain in the main.

Slug Method

In this method a continuous flow of water is fed with a constant dose of chlorine but with rates proportioned to give a chlorine concentration of at least 300 mg/l. The chlorine is applied continuously for a period of time to provide a column of chlorinated water that will contact all interior surfaces of the main for a period of at least three hours. As the slug passes tees, crosses etc., proper valves must be operated to ensure their disinfection. This method shall be used principally for large diameter mains where continuous feed is impractical.

Regardless of the method used, it is necessary to make certain that back flow of the strong chlorine solution into the supplying line does not occur. Following the prescribed contact period as directed by Engineer, the chlorinated water should be flushed to waste until the remaining water has a chlorine residual approximating that throughout the rest of the system. Bacteriological tests should be taken and if the result fails to meet minimum standards, the disinfection procedure must be repeated and the results again tested before placing the main in service.

D.9.1.19.9 Laying of Pipes and Fittings

All precautions shall be taken during excavation and laying operations to guard against possible damage to any existing structure / pipeline of water, gas, sewage etc. After excavation of trenches, pipes shall not be lowered unless the dimensions of trenches and bedding work for pipes at the bottom of the trenches and approved and measured by the Engineer-in-charge. Pipes and fittings / specials shall be carefully lowered in the trenches. Special arrangements such as cranes, tripods with chain pulley block for lowering the pipes and fittings / specials shall be made by Contractor. In no case pipes and fittings / specials shall be dropped. Slings of canvas or equally non-abrasive material of suitable width or special attachment to fit the ends of pipes and fittings / specials shall be used to lift and lower the coated pipes and fittings / specials. The pipes and fittings / specials shall be inspected for pipes and fittings / specials shall be inspected for defects and be rung with light hammer preferably while suspended to detect cracks. If doubt persists, further conformation shall be done by pouring a little kerosene / dye on the inside of the pipe at the suspected spot. No sign of kerosene / dye should appear on the outside surface. Pipes and fittings / specials damaged during lowering or aligning shall be rejected by the Engineer-in-charge.

All the pipes are to be laid perfectly true both in alignment and to gradient specified. In case of spigot and socket pipe the socket end of the pipe shall face upstream, except when the pipeline runs up hill in which case the socket ends should face the upgrade.

The laying of pipes shall always proceed upgrade of a slope. After placing a pipe in the trench, the spigot end shall be centered in the socket and the pipe forced home and aligned to required gradient. The pipes shall be secured in place with approved backfill material tamped under it except at the socket. Pipes and fittings / specials which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipes and fittings / specials of proper dimensions to ensure such uniform space. Precautions shall be taken to prevent dirt from entering the jointing space. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by Engineer-in-charge. During the period that the plug is on the contractor shall take proper precautions against floating of the pipe owing to entry of water into the trench. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or where long radius curves are permitted the deflection allowed at joints shall not exceed 2.5%. In case of pipes, with joint to be made with loose collars, the collars shall be slipped on before the next pipe is laid. The pipes shall be laid such that the marking on pipes appears at the top of the pipes.

The cutting of pipe for inserting valves, fittings or specials shall be done in a neat and workman like manner without damage to the pipe so as to leave a smooth end at right angles to the axis of the pipe. For this purpose, pipe-cutting machine shall be used.

D.9.1.19.10 Measurement

All pipes shall be measured according to the work actually done and no allowance will be made for any waste in cutting to the exact length required. Pipes and fittings shall be described by their internal diameter and length measured in running meters. The measurement shall be taken along the center line of pipe excluding fittings, which shall be measured separately. The lengths of pipes shall not include the portion of spigots within the sockets of fittings and pipes.

The rate for providing, laying and jointing of C. I. pipes and fittings shall be deemed to include the cost of jointing material and testing at work site.

D.9.1.19.11 Notes

If any damage is caused to the pipeline during the execution of work or while cleaning / testing the pipeline as specified, Contractor shall be held responsible for the same and shall replace the damaged pipeline and retest the same at his own cost to the full satisfaction of Engineer.

D.9.2 VALVES

D.9.2.1 SLUICE VALVES

D.9.2.1.1 General

The contract shall be covering manufacturing, supplying, testing at factory and delivery of:

Sluice valves conforming to IS: 14846-2000 with body, length over flanges Alt II with ISI certification mark on each valve.

D.9.2.1.2 Standards

The C. I. Sluice valves to be manufactured, supplied and delivered under the scope of this contract shall be manufactured in accordance with and conforming to Indian standard specifications and with ISI certification mark on each sluice valves.

D.9.2.1.3 Temperature Variations

All sluice valves, manufactured, supplied, tested and delivered shall be subjected to drinking water under variable temperature conditions ranging from 4⁰ to 45⁰ C.

D.9.2.1.4 Marking

The legible and indelible markings upon each valve shall indicate the following:

- (i) ISI certification mark on each sluice valve.
- (ii) Manufacturer's brand name and/or trade mark.
- (iii) Size of valve and nominal pressure of valve
- (iv) Heat number of cast.
- (v) Serial number in punch.
- (vi) Where a valve has been tested for only open end test, it should be marked "O" distinctly and permanently.
- (vii) Any other important mater that the manufacturer deems fit to be inscribed/embossed.

D.9.2.1.5 Test Certificate

- (1) The contractor shall always provide manufacturer's test certificate in accordance with every batch / lot of valves so manufactured and supplied.
- (2) The contractor shall also produce; in addition to manufacturer's test certificate as above, the inspection certificate issued by the authorized person of AMC.

D.9.2.1.6 Nominal Pressure

Each valve shall be subjected to hydrostatic tests as per IS: 14846-2000. The test pressure and test duration shall be as per table given below Table 1 and Table 2.

Table 1: Test Pressure for Sluice Valves

PN Rating	Test for Body / Seat	Test Pressure Mpa (Gauge)
PN 1.0	Body	1.5
	Seat	1.0
PN 1.6	Body	2.4
	Seat	1.6

Table 2: Test Duration for Sluice Valves

Valve Size mm	Test for Body / Seat	Test Duration Min.
50 to 1200	Body	5
	Seat	2

D.9.2.1.7 Material

The material for different component parts of Sluice valves shall confirm to IS: 14846 – 2000.

D.9.2.1.8 Flanges

The flanges and their dimension of drilling shall be in accordance with part –IV and VI of IS: 1538 (Part – I to XXII) 1976 (specification for cast iron fittings for pressure pipes for water, gas and sewage) or its latest revision.

D.9.2.1.9 Vender List

Sluice valves to be supplied and used by the contractor shall be of following make, subject to condition that valve shall conform to the requirement of tender specification. Necessary jointing material viz. Bolts, nuts, washers etc. shall be supplied by the contractor at his cost.

Approved Make for Sluice Valve / Butterfly Valve / Air Valve

- Kirloskar Brothers Limited
- Fouress Engineering Limited
- R & D Multiples
- Indian Valve Company

D.9.2.1.10 Testing

Defects noted during test and operation of sluice valve shall be refitted by the contractor at his own cost without any extra claim to the entire satisfaction of the Engineer-in-charge.

D.9.2.1.11 Fixing of Valves

Loading at store and unloading at site of works shall be done carefully using suitable mechanical handling devices such as crane, chain pulley etc. The arrangement of housing the valves with chambers and stable and firm foundations. The chamber and top roof cover with removable lid shall be provided so that it shall be possible to remove or replace or recondition the valves seats and to remove the parts without removing the valves from the pipe work. For this suitable flange adapters may be provided.

Valves used on pipeline shall be straight through type and non-chokable. Each valve or its operation equipment shall bear an approved name plate stating its function. All operation spindles, gears and head stocks shall be provided with adequate points for lubrications.

The tightening of nut and bolts shall be done smoothly in such a way that no excessive strain occurs on any one side. The nuts shall be tightened on diametrically opposite site at a time.

D.9.2.1.12 Information Required

Following documents/drawings shall be submitted by Bidder along with the quotation.

Preliminary outline dimensional drawings.
Typical cross section drawings.

Supplier's data sheet showing valve size, pressure rating, test pressures, list of tests to be conducted etc.

D.9.2.1.13 Scope

The rate of item covers cost of supply of valves with ISI mark along with all jointing materials and all labours for overhauling, lowering, laying, jointing with main pipe including all jointing materials like nuts bolts, rubber packing, and testing etc. The cost shall also include all taxes, duties, insurance etc. complete.

D.9.2.1.14 Payment

Payment shall be on number basis of the completed item.

VALVE CHAMBERS

The valves chambers consists the following items for construction.

- a) Excavation
- b) P.C.C. 1:3:6
- c) R.C.C. 1:1.5:3
- d) Providing and fixing HYSD bar reinforcement for RCC work
- e) Interior and exterior plain faced 15 mm thick cement plaster 1:3
- f) Providing and fixing fiber reinforced seat and heavy duty cover in line and level in CC 1:2:4
- g) Brick masonry in C.M. 1:5
- h) Providing and fixing cast iron steps confirming to IS 5455

- a) Excavation :

The excavation for chambers will be carried out as per the general technical specifications laid down under section "D-1", "Work in Trench Excavation and Back Filling". The excavation shall be carried out in all sorts of strata of soil and rock. The rate includes shoring, strutting and dewatering for which no extra payment will be made. The measurement shall be carried in length, Breadth and depth. The excess excavation carried out by the contractor will be filled with approved material for which no extra payment will be made. The excavation will be paid on cubic meter basis.

- b) P.C.C. 1:3:6 for foundation levelling course plain cement concrete proportion 1:3:6 shall be "Nominal Mix Concrete". The general technical specification as laid down for Nominal Mix Concrete in section D-6, Concrete Works shall apply to the item also. P.C.C. 1:3:6 is to be carried out for levelling course of the chamber after excavation is carried out. P.C.C. 1:3:6 will be carried out as per dimension length, breadth and thickness given in drawings. No extra payment will be made for the concrete of larger dimensions executed than shown in the drawings.

The payment will be made on cubic meter of concrete carried out.

- c) R.C.C. 1:1.5:3 for base slab, pedestal walls and slabs

R.C.C. 1:1.5:3 for different components of chambers shall be “Mix Design” and the technical specifications as laid down under section D-6” concrete works for mix design shall also apply to this item. The necessary tests for mix – design shall be carried out by contractor as directed by engineer in charge. The mix design for the concrete will be carried out by contractor at his cost. The payment will be made on cubic meter of concrete carried out.

d) Reinforcement – HYSD bars

The reinforcement shall be HYSD bar reinforcement for different components like walls, base slab and top slab of the chamber.

The general technical specifications as laid down under section D-6, “Concrete Works” sub head materials – Reinforcement specification for HYSD bars reinforcement shall apply to this item also. The HYSD bars shall be paid on weight basis i.e. MT and the weight will be arrived at using the standard weight per meter length of bar of each diameter.

e) Cement plaster 15 mm thick in C. M 1: 3

The cement plaster 15 mm thick in CM 1:3 is to be applied to inside of walls fully and from ground level to top of the manhole / chambers on outside.

Materials

The proportions of the cement mortar for plastering 15 mm thick shall be 1:3 (one part of cement to three parts of sand) unless otherwise specified under the respective items of work. Cement and sand shall be mixed thoroughly in dry condition and then just enough water added to obtain a workable consistency. The quality of water and cement grading of sand for plastering shall conform to IS: 1542. The mixing shall be done thoroughly in a mechanical mixer unless hand mixing is specifically permitted by the ENGINEER. If so desired by the ENGINEER Sand shall be screened and washed to meet the specification requirements. The mortar thus mixed shall be used as soon as possible preferably within 30 minutes from the time water is added to cement. In case the mortar has stiffened due to evaporation of water this may be re-tempered by adding water as required to restore consistency but this will be permitted only upto 30 minutes from the time of initial mixing of water to cement. Any mortar which is partially set shall be rejected and removed forthwith from the site. Droppings of plaster shall not be re-used under any circumstances.

Workmanship

Preparation of surfaces and application of plaster finishes shall generally conform to the requirements specified in IS: 1661 and IS: 2402.

Plastering operations shall not be commenced until installation of all fittings and fixtures in manhole /chambers are completed.

All joints in masonry shall be raked as the work proceeds to a depth of 10mm/20mm for brick/stone masonry respectively with a tool made for the purpose when the mortar is still green. The masonry surface to be rendered shall be washed

with clean water to remove all dirt, loose materials, etc., concrete surfaces to be rendered suitably by hacking or bush hammering for proper adhesion of plaster and the surface shall be evenly wetted to provide the correct suction. The masonry surfaces should not be too wet but only damp at the time of plastering. The dampness shall be uniform to get uniform bond between the plaster and the masonry surface.

Interior and exterior plain faced plaster this plaster shall be laid in single coat of 15 mm thickness. The mortar shall be dashed against the prepared surface with a trowel. The dashing of the coat shall be done using a strong whipping motion at right angles to the face of the wall or it may be applied with a plaster machine. The coat shall be trowelled hard and tight forcing it to surface depressions to obtain a permanent bond and finished to smooth surface. Interior plaster shall be carried out on jambs, lintel and still faces, etc. as shown in the drawing and as directed by the Engineer. Rate quoted for plaster work shall be deemed to include for plastering of all these surfaces.

Wherever more than 20mm thick plaster been specified, which is intended for purposes of providing beading, bands, etc. This work shall be carried out in two or three coats as directed by the ENGINEER duly satisfying the requirements of curing each coat (rendering /floating) for a minimum period of 2 days and curing the finished work for atleast 7 days.

Where specified in the drawings, rectangular grooves of the dimensions indicated shall be provided in external still in green condition. Battens shall be carefully removed after the initial set of plaster and the broken edges and corners made good. All grooves shall be uniform in width and depth and shall be true to the lines and levels as per the drawings.

Curing of plaster shall be started as soon as the applied plaster has hardened sufficiently so as not to be damaged when watered. Curing shall be done by continuously applying water in a fine spray and shall be carried out for at least 7 days.

The finished plaster surface shall not show any deviation more than 4 mm when checked with a straight edge of 2m length placed against the surface.

To overcome the possibility of development of cracks in the plastering work following measures shall be adopted.

Plastering work shall be deferred as much as possible so that fairly complete drying shrinkage in concrete and masonry works takes place.

Measurement

Measurement for plastering work shall be in sq. m. correct to two places of decimal. Unless a separate item is provided for grooves, mouldings etc., these works are deemed to be included in the unit rates quoted for plastering work.

- f) Heavy duty fibre cover with frame

The item includes providing and fixing heavy duty fibre reinforced seat and cover of approved quality and capacity. The same shall be fixed in line and level in C. C. 1:2:4 and will be finished smooth as directed by Engineer – in – charge. The payment will be made on number basis. The rates includes transportation loading and unloading of the FRC Cover.

g) Brick Work

Materials

Bricks used in the works shall confirm to the requirements laid down in IS: 1077. The class of the bricks shall be as specifically indicated in the respective items of work.

The nominal size of the modular brick shall be 200 mm x 100 mm x 100 mm with the permissible tolerances over the actual size of 190 mm x 90 mm x 90 mm as per IS : 1077. The nominal thickness of one brick and half brick walls using modular bricks shall be considered as 200 mm and 100 mm respectively. In the event of use of traditional bricks of nominal size 230 mm x 115 mm x 75 mm with tolerance upto +3 mm in each dimension, one brick and half brick walls shall be considered as 230 mm and 115 mm respectively.

Bricks shall be sound, hard, and homogenous in texture, well burnt in kiln without being vitrified, hand / machine moulded, deep red, cherry or copper coloured, of regular shape and size & shall have sharp and square edges with smooth rectangular faces. The bricks shall be free from pores, cracks, flaws and nodules of free lime. Hand moulded bricks shall be moulded with a frog and those made by extrusion process may not be provided with a frog. Bricks shall give a clear ringing sound when struck and shall have minimum crushing strength of 5 N/sq.mm unless otherwise specified in the item.

The average water absorption shall not be more than 20 percent by weight upto class 12.5 and 15 percent by weight for higher classes. Bricks which do not conform to this requirement shall be rejected. Over or under burnt bricks are not acceptable for use in the works.

Sample bricks shall be submitted to the Engineer for approval and bricks supplied shall conform to approved samples. If demanded by Engineer, brick samples shall be got tested as per IS: 3495 by Contractor at no extra cost to Owner. Bricks rejected by Engineer shall be removed from the site of works within 24 hours.

Fly Ash Bricks:

The bricks shall be hand or machine moulded and made from Fly ash, sand lime and additive. They shall be free from cracks, flaws. They shall have smooth rectangular faces with sharp corners and shall be uniform in colour. The bricks shall be machine moulded with a frog of size 100 mm. X 40 mm. and 10 mm. To 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 6 m.

The size of the conventional bricks shall be (9"x4.4/8" x 2.3/4") 225 mm. X 110 mm. X 75 mm.

Only bricks of one standard size shall be used on a particular work site. The following tolerances shall be permitted in the conventional size adopted in a particular work site.

Length: + 1/8" (3.0 mm.) Width: + 1/6" (1.50 mm.) Height: + 1/6" (1.50 mm.)

The crushing strength of the bricks shall not be less than 35 Kg/cm². The average water absorption shall not be more than 15% by weight. Necessary tests for crushing strength and water absorption etc. shall be carried out as per IS: 3495 (Part I to IV) 1976.

Mortar for brick masonry shall consist of cement and sand and shall be prepared as per IS: 2250. Mix shall be in the proportion of 1:5 as specified for brickwork of thickness one brick or above and 1:4 for brickwork of thickness half brick or below, unless otherwise specified in the respective items of work. Sand for masonry mortar shall conform to IS: 2116. The sand shall be free from clay, shale, loam, alkali and organic matter and shall be of sound, hard, clean and durable particles. Sand shall be approved by Engineer. If so directed by the Engineer, sand shall be screened and washed till it satisfies the limits of deleterious materials.

For preparing cement mortar, the ingredients shall first be mixed thoroughly in dry condition. Water shall then be added and mixing continued to give a uniform mix of required consistency. Mixing shall be done thoroughly in a mechanical mixer, unless hand mixing is specifically permitted by the Engineer. The mortar thus mixed shall be used as soon as possible, preferably within 30 minutes from the time water is added to cement. In case, the mortar has stiffened due to evaporation of water, this may be tempered by adding water as required to restore consistency, but this will be permitted only upto 30 minutes from the time of initial mixing of water to cement. Any mortar which is partially set shall be rejected and shall be removed forth with from the site. Droppings of mortar shall not be re-used under any circumstances.

The Contractor shall arrange for test on mortar samples if so directed by the Engineer.

Workmanship

Workmanship of brick work shall conform to IS: 2212. All bricks shall be thoroughly soaked in clean water for at least one hour immediately before being laid. The cement mortar for brick masonry work shall be as specified in the respective item of work. Brick work 200 mm / 230 mm thick and over shall be laid in English Bond unless otherwise specified. 100 mm/115 mm thick brickwork shall be laid with stretchers. For laying bricks, a layer of mortar shall be spread over the full width of suitable length of the lower course. Each brick shall be slightly pressed into the mortar and shoved into final position so as to embed the brick fully in mortar. Only full size bricks shall be used for the works and cut bricks utilized only to make up required wall length or for bonding. Bricks shall be laid with frogs uppermost.

All brickwork shall be plumb, square and true to dimensions shown. Vertical joints in alternate courses shall come directly one over the other and be in line. Horizontal courses shall be leveled. The thickness of brick thick or half brick thick wall, at least one face should be kept smooth and plane, even if the other is slightly rough due to variation in size of bricks. For walls of thickness greater than one brick both faces shall be kept smooth and plane. All interconnected brickwork shall be carried out at nearly one level so that there is uniform distribution of pressure on the supporting structure and no portion of the work shall be left more than one course lower than the adjacent work. Where this is not possible, the work shall be raked back according to bond (and not saw toothed) at an angle not exceeding 45°. But in no case the level difference between adjoining walls shall exceed one metre. Brick work shall not be raised more than one metre per day.

Bricks shall be so laid that all joints are well filled with mortar. The thickness of joints shall not be less than 6 mm and not more than 10 mm. The face joints shall be raked to a minimum depth of 10 mm / 15 mm by raking tools during the progress of work when the mortar is still green, so as to provide a proper key for the plastering / pointing respectively to be done later. When plastering or pointing is not required to be done, the joints shall be uniform in thickness and be struck flush and finished at the time of laying. The face of brick work shall be cleaned daily and all mortar droppings removed. The surface of each course shall be thoroughly cleaned of all dirt before another course is laid on top.

During inclement weather conditions, newly built brick masonry works shall be protected by tarpaulin or other suitable covering to prevent mortar being washed away by rain.

Brickwork shall be kept constantly moist on all the faces for at least seven days. The arrangement for curing shall be got approved from the Engineer.

Double scaffolding having two sets of vertical supports shall be provided to facilitate execution of the masonry works. The scaffolding shall be designed adequately considering all the dead, live and possible impact loads to ensure safety of the workmen, in accordance with the requirements stipulated in IS : 2750 and IS : 3696 (Part I). Scaffolding shall be properly maintained during the entire period of construction. Single scaffolding shall not be used on important works and will be permitted only in certain cases as decided by the Engineer. Where single scaffolding is adopted, only minimum number of holes, by omitting a header shall be left in the masonry for supporting horizontal scaffolding poles. All holes in the masonry shall be carefully made good before plastering / pointing.

In the event of usage of traditional bricks of size 230 mm x 115 mm x 75 mm, the courses at the top of the plinth and sills as well as at the top of the wall just below the roof / floor slabs and at the top of the parapet shall be laid with bricks on edge.

All brickwork shall be built tightly against columns, floor slabs or other structural members.

To overcome the possibility of development of cracks in the brick masonry following measures shall be adopted.

For resting RCC slabs, the bearing surface of masonry wall shall be finished on top with 12 mm thick cement mortar 1:3 and provided with 2 layers of Kraft paper grade 1 as per IS : 1397 or 2 layers of 50 micron thick polyethylene sheets.

RCC/ steel beams resting on masonry wall shall be provided with plain or reinforced concrete bed blocks of dimensions as indicated in the drawings duly finished on top with 2 layers of Kraft paper Grade 1 as per IS : 1397 or 2 layers of 50 micron thick polyethylene sheets.

Steel wire fabric shall be provided at the junction of brick masonry and concrete as specified elsewhere, before taking up plastering work.

The above item shall be measured and paid for separately under the respective items of work.

Where drawings indicate that structural steel sections are to be encased in brickwork, the brick masonry shall be built closely against the steel section, ensuring a minimum of 20 mm thick cement sand mortar 1:4 over all the steel surfaces. Steel sections partly embedded in brick work shall be provided with bituminous protective coating to the surfaces at the point of entry into the brick masonry.

Contractor shall note that the unit rates quoted for the masonry work shall be deemed to include for the installation of miscellaneous inserts such as pipe sleeves, bolts, steel sections with anchors etc. and providing pockets, leaving openings, cutting chases etc. in accordance with the construction drawings. Miscellaneous inserts shall be either supplied free by the owner or to be furnished by the contractor. Any of the miscellaneous inserts which are required to be fabricated and supplied by the Contractor and cement concrete to be provide in the pockets for the hold fasts of door / window frames etc. shall however, be measured and paid for separately under the respective items of work.

Measurement

Measurement shall be in Cu.m. Correct to two places of decimal for brickwork of thickness one brick i.e. 200 mm/230 mm and above. Measurement shall be in sq.m. Correct to two places decimal for facing brickwork and brickwork of thickness half brick i.e. 100 mm / 115 mm and below. Measurement shall be for the quantities as actually executed duly deducting for openings, lintels, executed duly deducting for openings, lintels, transoms / mullions etc. All concrete works shall be measured and paid for separately under the respective items of work.

- h) Providing and fixing cast iron rungs / steps in chamber in line and levels etc. complete.

The C. I. Rungs / steps will be fabricated out of approved section of cast iron in concrete or masonry walls of chamber. The same shall be fixed at 35 cm. C/C and 35 cm staggered or as approved by Engineer in charge. The payment will be made on number basis.

D.9.3 DUCTILE IRON (DI) K-9 CLASS

The hydrostatic site test pressures and hydraulic working pressures of each size of pipe shall be as per Annexure – E (Table – 1) of IS: 8329: 2000.

Applicable Codes

Following IS code shall be applicable for:

1. The pipes shall conform to IS 8329-2000 with BIS certification markings on each pipe.
2. The rubber gaskets shall conform to IS: 5382 – 1969 or its latest edition.

GENERAL TECHNICAL SPECIFICATIONS

Scope

The items includes following operations.

- a) The pipe shall be manufactured for centrifugally cast (spun) ductile iron pipe for pressure pipes, manufactured in metal (lined or unlined) or sand moulds and their joints for construction of pipelines to convey water and to be installed underground and to be operated with pressure.
- b) Cement mortar lining shall be as per Annexure B of IS 8329 – 2000 and thickness, tolerances and maximum crack width shall be as given below.

The lining shall be with high alumina cement (as per IS-6452).

- c) The pipes will be externally coated with bituminous coating as per Annexure – C of IS – 8329-2000 at store at site of work.

Standards

The ductile iron pipes to be manufactured, supplied and delivered under the scope of this contract shall be manufactured in accordance to and conforming to 8329-2000 or its latest revision **with ISI certification marking.**

Scope of Item

The scope of item shall include all cost for Labour, materials and machinery etc. necessitated to be utilized for:-

- a) Proper manufacturing of the D. I. Pipes.
- b) All tests required to be undertaken at manufacturer's premises as per IS.
- c) Transportation of the pipes either by rail and or road services with all the covers duly appropriately insured by contractor.
- d) Delivery of pipes with proper loading, unloading, stacking at site of work as indicated by Engineer- in-charge.

Marking

The method of marking all the pipes to be delivered under scope of this item shall ensure that all the information will remain legible even after transportation, stacking on site etc. In general the legible and indelibly marking upon each pipe shall be indicate the followings.

- i) Manufacturer's brand name and / or trade mark.
- ii) The nominal diameter and class reference.
- iii) The lasts two digits of the year of manufacture.
- iv) BIS certification marking.
- v) Any other important matter, the manufacturer deems fit to be described.

All these marking shall be done:-

- (a) On the socket faces of pipe, centrifugally cast in metal mould and
- (b) On the outside of socket or on the barrel of pipe, centrifugally cast in sand mould.

Workmanship

All pipes shall be well finished and when visually inspected shall be free from defects such as cracks surface flaws, laminations etc.

Rubber gaskets used with push – on – joints shall conform IS: 5382 shall be compatible with drinking water to be conveyed at the working pressure and temperature. Therefore, **the rubber gaskets shall not deteriorate the quality of water and shall not impart any bad taste or foul odour.**

Sampling

Sampling criteria for various tests shall be as laid down in IS: 11606.

The mechanical acceptance tests shall be carried out on samples of DI pipes as shown in Clause 9.2 of IS: 8329 – 2000.

Mechanical Tests

Mechanical tests shall be carried out during manufacturing of the pipes in the factory. The following tests are required to be carried out.

- (a) Tensile Test
- (b) Brinnell Hardness Test
- (c) Retest

Hydraulic Test

All the pipes shall be tested hydrostatically at a pressure specified in Table No. 1 of IS: 8329 – 2000.

Test Certificates

- a. The contractor shall always provide manufacturers test certificate for the grade of material and tensile strength in accordance with every batch/lot of goods as manufactured and supplied.

- b. The contractor shall also produce in addition to manufacturer's test certificate as mentioned above test certificate from person / agency appointed by Ahmedabad Municipality for third party inspection.
- c. If the test reports of pipe are not satisfactory, the entire lot will be rejected.
- d. Each pipe and special shall be inspected and tested in factory and a special register of pipe testing shall be maintained and a copy of the same shall be submitted along with the delivery of pipes and specials every time.

DETAILED TECHNICAL SPECIFICATION

Manufacture

- a) The metal used for the manufacture of pipes shall be of good quality commensurate with the mechanical requirements laid down in IS-1387. It shall be manufactured by any method at the discretion of the manufacturer provided that the requirements defined in this standard are complied with.
- b) The pipes shall be stepped with all precautions to avoid warping or shrinkage defects, detrimental to their good quality. The pipes shall be sound and free from surface or other defects. Pipes showing small imperfections which result from the method of manufacture, and which do not affect service ability, shall not be rejected on that account alone. Minor defects arising out of manufacturing process may be rectified with the consent of the purchaser.
- c) Pipes centrifugally cast shall be heat treated in order to achieve the necessary mechanical properties and to relieve casting stresses caused due to the method of manufacture and repair work.
- d) If necessary the pipes may be subjected to reheat treatment to ensure that Brinnell hardness does not exceed the specified value and the specified mechanical properties are achieved as specified.
- e) Pipes shall be delivered internally and externally coated.

Internal lining: High alumina Cement mortar lining as per Annexure – B of IS 8329: 2000

External coating: Bituminous coating as per Annexure– C of IS: 8329: 2000

Length of Pipes

The standard working length of socket and spigot pipes shall be 4.0 meter, 5.0 meter, 5.5 meter and 6.0 meter and for flanged pipes shall be 4 meters, 5 meters and 5.5 meters.

Tolerance on Thickness

Tolerance on thickness, external diameter, length and ovality shall be as per IS 8329:2000 or its latest revision or amendment.

Testing of Pipes

The main test among others to be conducted shall be as per IS 8329-2000 or with its latest revision or amendments and the **test reports shall be submitted along with each delivery of pipes and / or specials.**

Rubber Gaskets

- A) Rubber gaskets for use with push-on-joints or mechanical joints shall conform to IS: 5382 – 1969 or its latest edition.
- B) Rubber gaskets for push-on, mechanical and flanged joints shall be compatible with the fluid to be conveyed for materials, pressure and temperature.
- C) Rubber gaskets for mechanical joints may be suitably protected so that the elastomer does not come in direct contact with the water.
- D) Rubber gaskets for use with flanged joints shall confirm to IS 638:1979.
- E) While conveying potable water, the gaskets should not deteriorate the quality of water or should not impart any bad taste or foul order.

Stacking of Pipes

On receipt the pipes shall be stacked on wooden/concrete sleepers to ensure that they do not come in contact with earth. The contractor shall take necessary precautions for safety of pipes; so that no damage occurs during stacking.

Inspection

Inspection of pipes and specials will be carried out by Engineer in Charge or his representative agency appointed by AMC. All the expenditure for inspection shall be borne by the Contractor except, inspection charges if any, in case of inspection agency appointed by AMC, shall be paid by AMC.

Laying, Jointing and Anchoring

Pipes shall at all times be handled with care in accordance with manufacturer's recommendations. Pipes shall be lowered into the trench with tackle suitable for the mass of the pipes. A mobile crane of a well-designed set of shear legs shall be used and the positioning of the sling checked, when the pipe is just clear of the ground to ensure a proper balance where lifting equipment is not available, small diameter pipes (normally DN 250 Mix) shall be lowered by hand using suitable ropes.

All persons shall vacate the section of the trench into which the pipe is being lowered.

All construction debris should be cleared from the inside of the pipe either before or just after a joint is made. This can be done by passing a pull through along the pipe or by hand, depending on a diameter of the pipe. When laying is not in progress, a temporary and closure shall be filleted securely to the open end of the pipeline. This may make the pipes buoyant in the event of end trench becoming flooded in which case the pipes shall be held down either by partial re-filling of the trench or by temporary strutting.

Jointing procedures will vary according to the type of joint being used.

- (a) Clean lines of all parts
- (b) Correct location of components
- (c) Centralization of spigot within socket and
- (d) Strict compliance with the manufacturers jointing instructions.

The inside of sockets and the outside of spigots shall be cleaned for atleast the insertion depth for each joint.

Gaskets shall be wiped clean and inspected for damage. Where lifting gear has been used to support the pipe and assist in centralizing the spigot in the socket. Where the pipeline is suspected to be subject to movement due to ground settlement or temperature variation a suitable gap shall be left between the end of the spigot and the bottom of the socket. To ensure this two hand marks and made near the spigot end after jointing the end of the socket must end between these two bands.

The cutting of pipe for inserting valves, fittings etc. shall be done in a neat and workmanlike manner without damage to the pipe or lining so as to leave a smooth end at right angles to the axis of the pipe. The burr left after cutting shall be trimmed off by light grinding or by filing.

In case of short length requirement if DI pipe is required to be cut, contractor has to cut. Pipe by electric cutter and the cut end should be champhered for to be suitable for push – on – joint. No extra payment shall be made for this.

Jointing pipes laid on gradients

If pipes are laid on steep gradients where the soil/pipe friction is low, care shall be taken to ensure that no excessive spigot entry or withdrawal occurs. As soon as the joint assembly has been made. The pipe shall be held in place and the trench back filled over the barrel of the pipe.

Unless the gradient 1:2 or steeper, anchorage's are not normally necessary. However of these very steep gradients, restrained joints or anchor blocks at each socket are recommended.

Anchoring

External anchorage shall be provided at blank ends, bends, tees, tapers and valves to resist the thrust arising from internal pressure and dynamic loading. Anchor and thrust blocks shall be designed to withstand the forces resulting from the internal pressure when the pipeline is under test, taking into account the safe bearing pressure of the surrounding soil. Considerations shall also be given to forces on the pipeline, when empty, and precautions taken against possible flotation. Wherever possible, concrete anchor blocks shall be of such a shape as to leave the joint area clear.

Hydrostatic Testing of the Pipeline

- A test length shall not be more than 1000 m. on straight or curved line.
- All air shall be expelled from the test segment by marking air vents at the highest point of the test section.
- The first part of the testing shall be to stabilize the section at a lower pressure of 1-2 kg/sq./cm at the highest point for a duration of at least 4 hours. On satisfactory completion of this, joints shall be tested against leakage by increasing the test pressure to 1.5 times the maximum working pressure in the section or as specified and holding it for 15 minutes.

- If the pressure drop is less than 0.2 kg/Sq.Cm over this period, the test shall be deemed satisfactory.
- For the purpose of the test, either power-driven or manual reciprocating pumps shall be used with clean water.
- The pressure gauges shall be in good condition and of suitable ranges such as 0.4 kg/sq.cm or 0.7 kg/sq.cm, as required.
- The air vent holes shall be properly plugged and sealed with M-Seal on completion of the test.

A pipe segment once tested shall not be used as a support to anchor the end blocks used for testing the next segment.

Cleaning

Before a pipeline can be considered ready for service, it shall be cleaned internally as thoroughly as possible to ensure that no foreign matter remains inside the pipe. The first stage of the cleaning operation i.e. cleaning individual pipes during jointing, shall be performed. Pigs of suitable design e. g. polyurethane swabs, may be used provided that the pipeline has been constructed to allow the passage of such pigs. Here the pipeline is to be tested with water, the fillings and emptying of the pipeline may to some extent cleanse the line.

The Scope for the item covers:

- Cost required for jointing cleaning the site of all scrubs, bushes, and trees and dewatering where necessary.
- Cost of all materials like steel, cement, aggregate, bolts, nuts, washers, gasket etc. necessary for pipe lowering, laying & jointing.
- Labour for laying pipes in trenches to correct alignment at required depth with tools, including cutting of pipes and specials if required for laying of pipes including connecting pipes to specials and appurtenances.
- Cost of scaffolding, tools and plants, ropes etc.
- Protection of existing works from damage and cost of repair to the damages carried out of the existing structures, sewer line, telephone/electricity cables, gas pipe line, water supply / irrigation pipe line etc.
- Labour for making joints including jointing material for joints, tools as well as tests. Testing of pipes for leakage under water pressure and flushing the pipes after testing and construction work shall have to be arranged by the contractor at his own cost.

Method of Measurement and Payment

The measurement shall be made in running meter basis.

Ductile Iron fitting

Specifications

The fittings shall be tees, bends, reducers etc. Ductile iron fittings shall conform to IS – 9523 with the latest revision inclusive of high alumina internal cement mortar lining at the store or site of work including freight, loading, unloading stacking including all taxes, insurance etc. complete. The fittings shall be bitumen coating on the external surface of fittings.

D-10: PLUMBING SYSTEM

SECTION: D-10

D.10.1 SCOPE

D.10.1.1 This specification covers the general requirements for execution of plumbing system comprising of water supply and distribution pipes, fittings, sanitary appliances, traps, soil, waste, vent and rain water pipes, building drains and sewers including their respective connections, devices and appurtenances within or adjacent to any building.

D.10.2 APPLICABLE CODES

D.10.2.1 The following specifications and codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the specifications and codes shall be referred to. In case of discrepancy between this specification and those referred to herein, this specification shall govern.

D.10.2.2 Codes of Practice

- 1) IS : 1172 - Basic requirements for water supply, drainage and sanitation.
- 2) IC : 2065 - Water Supply in buildings.
- 3) IS : 1742 - Building drainage.
- 4) IS : 5329 - Sanitary pipe work above ground for buildings.
- 5) IS : 2064 - Selection, installation and maintenance of sanitary appliances
- 6) IS : 4127 - Laying of glazed stoneware pipes.
- 7) IS : 2527 - Fixing rainwater gutters and down-pipes for roof drainage.

D.10.2.3 Specifications for Materials

- 1) IS : 3989 - Centrifugally cast (spun) iron spigot and socket soil, waster and ventilating pipes, fittings and accessories.
- 2) IS : 1729 - Sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
- 3) IS : 1230 - Cast iron rainwater pipes and fittings.
- 4) IS : 1239 STEEL - Mild steel tubes, tubular and other wrought fittings :
Part I
- Mild Steel tubular and other rough steel pipe

- fittings : Part – II
- | | | | |
|-----|---------------------------|---|--|
| 5) | IS : 404 | - | Lead pipes |
| 6) | IS : 1626 | - | Asbestos cement building pipes, and fittings.
(Spigot and socket type.) |
| 7) | IS : 651 | - | Salt-glazed stoneware pipes and fittings. |
| 8) | IS : 778 | - | Gunmetal gate, globe and check valves for general purposes. |
| 9) | IS : 781 | - | Cast copper alloy screw-down bib taps and stop valves for water services. |
| 10) | IS : 1795 | - | Pillar taps for water supply purpose. |
| 11) | IS : 1703 | - | Ball valves (horizontal plunger type) including floats for water supply purpose. |
| 12) | IS : 774 | - | Flushing cisterns for water closets and urinals
(Valve less siphon type). |
| 13) | IS : 2326 | - | Automatic flushing cistern for urinals. |
| 14) | IS : 771 | - | Glazed earthenware sanitary appliances. |
| 15) | IS : 2526
Part-I to XV | - | Vitreous sanitary appliances (Vitreous china) |
| 16) | IS : 1726 | - | Cast iron manhole covers and frames intended for use in drainage works. |
| 17) | IS : 5455 | - | Cast from steps for manholes. |

D.10.3 GENERAL

- D.10.3.1 The plumbing work shall be carried out through licensed plumber and shall comply in all respects with the requirements of these specifications.
- D.10.3.2 All sanitary appliances including sanitary fitting fixtures shall be as specified in the item of work and as per the sample approved by Engineer.
- D.10.3.3 Any openings made in wall/slab for providing pipes etc. should be made good by Contractor. Also any scaffolding / temporary supports required for execution of wall shall be provided by Contractor at no extra cost to Owner.
- D.10.3.4 All the tests certificates required for sanitary fixtures are to be made available by contractor and the testing of water supply and drainage system to be done as per the specifications at no extra cost to Owner.
- D.10.3.5 The location of plumbing fixtures. Fittings and related ancillary works shall be shown on relevant drawing.
- D.10.3.6 However, detailed drawing, if required shall be prepared by Contractor and got approved from Owner / Engineer before commencing the plumbing work.

D.10.4 WATER SUPPLY SYSTEM

D.10.4.1 Storage Tanks

D.10.4.1.1 Underground Storage Tanks

In case of underground storage for domestic purpose, the following requirements shall be complied with:

- a) The tank shall project at least 30 cm above the highest flood level. Where this is not possible the manhole cover shall be raised 30 cm above the highest flood level of the locality or ground level whichever is higher.
- b) The tank shall be such as to provide for the drawing of the tank when necessary and water shall not be allowed to collect round about the tank.
- c) The tank shall be perfectly watertight.
- d) The inner surface of the tank shall be rendered smooth as far as possible.
- e) The top of tank shall be so leveled as to prevent accumulation of water thereon.
- f) The tank shall have a complete concrete cover leaving a manhole opening provided with a properly fitting fibre reinforcement cover. Where tank is of large size, adequate number of manholes shall be provided as per detailed drawing.
- g) No gap shall be allowed to remain found the suction pipe and arrangements shall be provided for proper discharge of spill water from the electric pump by connecting the pump cabin to the water drain or by providing a small hole which will enable the water to flow out.
- h) The overflow pipes or vent shafts if provided shall have a wire gauge cover of 1.5 mm mesh properly screwed tightly to the opening. The underground storage tank shall be of such type and size as mentioned in respective item of work.

D.10.4.1.2 Overhead Storage Tanks

D.10.4.1.2.1 The overhead storage tanks shall be of such type and size as specified in the item of work. The general requirements shall be as follow:

D.10.4.1.2.2 The tanks shall be watertight and properly covered with a closed fitting mosquito-proof lid fitted with a locking arrangement and shall be provided with a sound and suitable ball valve and float conforming to IS: 1703 securely fixed to the tank and set in such a position that the body of the ball valve can not become submerged when the tank is full up to the water line. Ball valve shall be so adjusted as to limit the level of water in the tank to 25 mm below the lip of the warning or overflow pipe. A stop valve / gate valve shall be provided as near the tank as practicable on every outlet pipe from the storage tank, excepting the warning pipe. The outlet pipe from the storage tank, excepting the warning pipe. The outlet pipes shall be fixed 50 to 75 mm above the bottom of the tank and provided preferable with copper gauge strainers. The washout or draining pipe shall be made flush at the bottom of the tank at its lowest point. The floor of the tank shall be erected so as to give a slight fall to the washout pipe for cleaning purpose. All the tanks shall be perfectly watertight. In case of M. S. Tank these shall be painted with one coat of red oxide primer both internally and externally. On the inside two coats of bitumastic paint shall be applied and on the exterior two coats of paint of approved make and tint shall be applied.

D.10.4.2 Water Supply Pipes and Fittings

D.10.4.2.1 G. I. Pipes and Fittings

D.10.4.2.1.1 .Pipes shall be galvanised mild steel butt welded and seamless, screwed, socketed and plain and tubes (Commonly known as G.I. Pipes) conforming to IS: 1239 Part-I. The fittings shall be galvanised wrought steel welded and seamless conforming to IS: 1239 Part-II. The pipes and fittings shall be of such class and diameter (nominal bore) as specified in the respective items or work. These shall be cleanly finished and reasonable free from scale, surface flaws, lamination and other defects. The screw threads of pipes, sockets and fittings shall be clean and well cut the ends shall be cut cleanly and square with the axis of the pipe unless otherwise specified. Galvanizing of pipes and fittings shall be in accordance with IS: 4736. Pipes laid below ground shall be of heavy class and shall be coated with bitumastic paint and enwrapped with Hussein cloth. Pipes used above ground shall be of medium class. The pipes shall be cleaned and cleared and cleared of all foreign matter before being laid / fixed. In jointing the pipes the inside of the socket and the screwed and of the pipes shall be oiled and rubbed over with white lead and a few turns of spun yarn wrapped around the screwed and of the pipe. The end shall then be screwed in the socket, tee etc., with the pipe wrench. Care shall be taken that all pipes and fittings are properly jointed so as to make the joints completely water tight and pipes are kept at all times free from dust and dirt during fixing. Burr from the joint shall be removed after screwing. After laying, the open ends of the pipes shall be temporarily plugged to prevent access of water Soil or any other foreign matter. All pipes and fittings shall be fixed truly vertical and horizontal unless unavoidable. The pipes shall be fixed to wall with standard pattern holder but clamps of required shape and size so as to fit tightly on the pipes when tightened with screwed bolts. All pipes inside the shaft shall remain clear off wall by at least 12 mm. All exposed G. I. pipes and fittings shall be painted with one coat of red oxide primer and two coats of oil paint of approved make and colour as directed by Engineer. Where concealed, piping is required to be done as per item of work, pipes and fitting after jointing shall first be coated with bitumatic paint and enwrapped with Hussein cloth and then embedded in a chase of required size cut in internal wall. The chase shall be filled with cement mortar (1:3) as directed by Engineer. The length of piping required to be concealed shall be measured and paid separately.

D.10.4.3 Water Supply Fittings and Appliances

D.10.4.3.1 General Requirementsw

D.10.4.3.1.1 All cast fittings shall be sound and free from laps, blowholes and pitting; and both external and internal surfaces shall be clean, smooth and free from sand. Burning, plugging or patching of the casting shall not be permissible. The bodies, bonnets, spindle and other parts shall be machined so that when assembled the parts shall be axial, parallel and cylindrical, with surfaces smoothly finished. The fittings shall be fully examined and cleaned of all foreign matter before being fixed. The fittings shall be fixed in the pipeline in workman like manner. The joints between fittings and pipes shall be made watertight.

D.10.4.3.2 Gate, Globe and Check Valves

D.10.4.3.2.1 The gunmetal gate, globe and check valve shall conform to IS: 778 and shall be of such class (1/2), type (screwed / flanged) and size (nominal bore) as mentioned in respective item of work.

D.10.4.3.3 Bib Taps and Stop Valves

D.10.4.3.3.1 Screwed down bib taps and stop valves shall conform to IS: 781 whereas pillar taps shall conform to IS: 1795. In case of chromium plated (CP) fittings the thickness of plating shall not be less than service grade No. 2 of IS: 4827. The plating shall be capable of taking high polish and shall not easily tarnish or scale. The standard size of fittings shall be designated by the nominal bore of the pipe outlet to which the fittings are attached.

D.10.4.3.4 Self Closing Taps

D.10.4.3.4.1 Self-closing taps shall be of non-concussion type and shall comply with IS: 1711. In case other special fittings are required to be used for water supply system, these shall be of such size, shape and of approved make as per the requirements of competent authority.

D.10.4.3.5 Shower Rose

D.10.4.3.5.1 The shower rose shall be of chromium plated brass of specified diameter. It shall have uniform perforations. The inlet size shall be 15 mm or 20 mm as specified. In case of shower rose vitreous china, this shall conform to IS: 2556 (Part-XI).

D.10.4.3.6 Flushing Cisterns

D.10.4.3.6.1 The flushing cisterns shall be automatic or manually operated, high level or low level and of such capacity as specified in item of work for urinals and water closets. Valveless siphoned type flushing cistern shall be of cast iron, glazed earthenware, vitreous china or pressed. Steel complying with the requirements of relevant I. S. codes and shall be provided as mentioned in respective item of work. A high level cistern is intended to be operated with minimum height of 125 cm and a low level cistern with a maximum height of 30 cm between the top of pan and the underside of the outlet shall be of 32 mm nominal bore and in the case of low level cisterns, the outlet shall be of 40 mm nominal bore. Ball valve shall be of screwed type 15 mm in diameter and shall conform to IS: 1703. The chain of cistern shall be galvanised steel wire and shall be of such strength as to sustain a dead load of 50 Kg. without any apparent or permanent deformation of shape of the link. The chain shall terminate in a suitable handle or 'Pull' which shall be of galvanised iron or non-ferrous metal, or a moulding in any heat resisting and non-absorbent plastic. The finish shall be smooth and free from burrs. In case of low level flushing cisterns the handle shall be chromium plated. The overflow pipe for cistern shall be of not less than 20 mm nominal bore with mosquito-proof device. The cast iron cistern shall be painted with two coats of black bitumastic paint on the inside and one coat of grey paint or a coat of emulsion on the outside. The cisterns shall be supported on two R. S. cast iron or mild steel brackets of size as approved by Engineer. The discharge rate of the cistern shall be about 5 liters in 3 seconds when connected to an appropriate flush pipe and there shall be no appreciable change in the force of flush during the period of discharge. The cistern shall have

discharge capacity of 5, 10 or 12.5 liters as specified in item of work with a tolerance of (+/-) 0.5 liter or of 15 liters with a tolerance of (+/-) 1 liter.

D.10.5 SANITARY APPLIANCES

D.10.5.1 General Requirements

D.10.5.1.1 All sanitary appliances and their components shall be durable. Impervious, corrosion resisting and have a smooth surface, which can be easily cleaned. These shall conform to relevant Indian Standards where it exists. In other cases these shall be of the best quality, workmanship and approved make. In general all glazed earthenware sanitary appliance shall (vitreous china) shall conform to IS: 2556 (Part-I to XV). Utmost care shall be taken to avoid any damage to sanitary appliances during transport, handling and fixing etc.

D.10.5.2 Wash Basins

D.10.5.2.1 Wash basins shall conform to the requirements given in IS: 771 or IS: 2556 (Part-IV) as mentioned in item of work. The wash basin shall be made in one piece and shall include a combined overflow and shall be such so as to facilitate cleaning. Where the wash basins are fixed in ranges, it is desirable that they shall be placed at centre to centre of at least 75 cm to ensure comfort when basins are in use; the centre line of the last basin shall be kept at least 40 cm away from the adjacent wall. The overflow shall be an open-weir type with removable grating of a slot type. The basin shall be such as to prevent slopping. Soap traps or sinking shall be provided to drain into the basin. Tap holes shall be square or round to suit pillar tap conforming to IS: 1795 and shall be leveled around the opening to enable fixing of pillar taps perpendicular to wash basins. The waste outlet shall be bevelled or rebated to receive a waste fitting. Where there is no other means of fixing, a hole shall be provided for the setting of the plug of the chain. Cast iron brackets and supports for wash basins and sinks shall conform to IS: 775. Brackets for screwing to walls are provided with ear holes for fixing screw, which should be screwed into suitable wall plug. In the case of this partition walls especially where this appliances are heavy, suitable from of floor support may be used, if however (as in the case of light appliances), wall fittings are used, they should be bolted through the wall, using back plates on the remote side.

D.10.5.3 Sinks

D.10.5.3.1 Sinks for kitchen use shall conform to IS: 771. Sinks for laboratory use shall conform to IS: 771 or IS: 2556 (Part-V). Hot and cold water supplies shall be provided as specified, the tap being mounted above the sink. The sinks shall be of one-piece construction, including a combined overflow. The floor of the sink shall gently slope towards the outlet. The outlet shall in all cases be suitable for waste fittings having flanges of 38 mm diameter of 65 mm at the bottom to suit the waste fittings. The waste hole shall be either rebated or bevelled having a depth of 10 mm. Sink shall be provided with a non-ferrous 50 mm dia waste fitting. The sink shall have overflow of the weir type and the invert shall be 30 mm below of the edge. Sink shall be provided with a waste plug, of suitable dia, chain and stay. The general requirements of fixing the sinks shall be same as mentioned for wash basins.

D.10.5.4 Urinals

D.10.5.4.1 Urinals shall conform to the requirements given in IS: 771 or IS: 2556 (Part-VI). The type, size and shape of urinals shall be as per respective item of work. The urinals shall be durable non-corrodible and shall have a hard glazed surface and these shall be manufactured in one piece without crack, joint or recess. The sidewall and back of urinals shall be made of hard, durable, impervious material. It shall be provided with a drain ending with a trap and provision for cleaning the floor. Urinals shall be provided such that a minimum clear width of 60 cm between the partitions is kept. Top of bowl shall be about 60 cm from the floor level. A drain of such width as shown on drawing shall be provided at the bottom of stall urinals so that other places are not fouled in usage. In case of open drain, it shall be of glazed type. Half-round channels for urinals shall conform to IS: 771 or IS: 2556 (Part-VIII). Urinals shall be provided with flushing cistern (manually operated / automatic) discharging through flush pipes and spreaders as mentioned in respective item of work. Urinal outlet shall be provided with dome shaped removable grating.

D.10.5.5 Water Closets

D.10.5.5.1 Squatting Pans (European Type W.C.)

D.10.5.5.1.1 Water closets shall be either of white glazed earthenware, white glazed vitreous china or white glazed fire clay as specified and shall be of “Siphonic Wash down type” conforming to IS : 2556 (Part VIII). The closets shall be of one piece construction with approved plastic / bakelite seat and cover. Each water closet shall have 4 fixing holes having a minimum diameter of 6.5 mm for fixing to floor and shall have an integral flushing rim of suitable type. It shall also have an inlet of supply horn for connecting the flush pipe. The flushing rim and inlet shall be of the self-draining type. The water closet shall have a weep hole at the flushing inlet. Each water closet shall have an integral trap with either “S” or “P” outlet with atleast 50 mm water seal. The water closets shall have an antisiphonage 50 mm dia. Vent born on the outlet side of the trap. The inside of water closets and traps shall be uniform and smooth in order to ensure in efficient flush. The serrated part of the outlet shall not be glazed externally. The water closet when sealed at the bottom of the trap in line with the back plate, shall be capable of holding not less than 10 litres of water between the normal water level and the highest possible water level of the water closet installed.

D.10.6 WASTE WATER SYSTEM

D.10.6.1 Cast Iron Soil, Waste and Vent Pipes and Rain Water Pipe and Fittings

D.10.6.1.1 Cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories shall conform to IS: 1729 or IS: 3989. The pipes and fittings shall be true to shape, smooth and cylindrical, their inner and outer surfaces being as nearly as practicable concentric. They shall be sound and nicely cast and shall be free from cracks, laps, pin holes or other imperfection and shall be neatly dressed and carefully reasonably square to their axis. The cast iron pipes and fittings shall be of such nominal diameter as mentioned in the respective item of work and the pipes shall be of longest length available unless shorter lengths are either specified or required at the junctions etc. The pipes and fittings shall be supplied without ear unless specified or directed otherwise. All pipes and fittings shall ring clearly when struck over with a light hand hammer and shall be capable of being easily worked with a drill or file. All soil,

wastes and ventilating pipes shall be carried up above the roof, if required to such height as specified or directed and shall be provided with C. I. cowl. The minimum diameter of soil and rain water, waste water and vent pipes shall be 100 mm, 75 mm and 50 mm respectively. All pipes and fittings shall be properly cleared of foreign material and shall be perfectly dry before jointing. The spigot shall be centered in the socket by tightly caulking in sufficient turns of tarred gasket or hemp yarn to leave unfilled half the depth of socket for lead. A jointing ring shall then be placed round the barrel and against the faces of the socket. Molten pig lead shall then be poured into fill the remainder of the socket. The lead shall then be solidly caulked with suitable tools and hammer of not less than 3 Kg. Weight right round the joint to make up for the shrinkage of the molten metal on cooling and shall be perfectly finished 3 mm behind the socket face. Lead for caulking shall conform to IS: 782. In case the cement mortar joint is specified in the item of work, the following procedure shall be adopted. The joint is first yarned with hemp yarn dipped in the cement slurry. The yarn is first inserted to slight depth and well pressed in the same manner as for lead jointing. Then cement mortar (1:1) with a water cement ratio not exceeding (1:5) shall be rammed into the joint by caulking tools and the joint completely filled. The joint shall be kept wet for 24 hours after making. The pipes and fittings shall be fixed to the walls on wooden cleats fixed to the stone and or brick walls by means of special W.I. clamps and round headed nails so as to keep clear of the surface of the walls unless projecting ears with fixing holes are provided at socket end of pipes or by approved inserts well fastened to the walls. The access door fittings shall be such as to avoid dead spaces in which filth may accumulate. Doors shall be provided with 3 mm rubber insertion packing and when closed and bolted, these shall be air and watertight. The floor traps, nahni traps etc. shall conform to IS: 3989. All exposed cast iron pipes and fittings shall be painted with one coat of red oxide primer and two coats of zinc based paint of approved make and shade.

D.10.6.2 Lead Pipes

- D.10.6.2.1 Lead pipes shall conform to IS: 404. The pipes shall be sound and free from lamination, flaws, pronounced extrusion marks or other imperfections and shall be as far as possible, be circular in cross section, smooth and of uniform wall thickness throughout. The chemical composition, wall thickness, weights and other specifications of lead pipes shall be as per relevant tables depending on different types of uses as specified in IS: 404. Lead pipes when not supported on bearers, shall be supported by strong lead-tacks at least 40 mm wide soldered on to the pipes at suitable intervals. All joints for lead pipes shall be of wiped solder joints. The pipe ends to be jointed shall be cleaned with wire brush and shall be free from oxide if any. Chalk shall be rubbed and shall be free from greasy nature of lead. After this, plumber's black shall be applied. Suitable length of joint (approximately 60 mm to 90 mm) shall be marked on the pipe. A fine shaving of lead shall be removed from this length with shave hook. Tallow shall then be smeared over the prepared surface. The molten solder, an alloy composed of 3 parts of tin and 7 parts of lead, shall be poured in a thin stream from a ladle moved in elliptical direction over the joint position, when sufficient solder has been poured, the joint shall be wiped with a pad of wiped cloth with long continuous movements in one direction only so as to leave a neatly formed elliptical shaped bead removed with a tool called "draw off". The joint shall be air and water tight and free from tears, burrs, strings, ribbons or dropping. The jointing of lead pipes with C. I. or stone ware pipes shall be as follows:

D.10.6.2.2 One end of the brass ferrule or thimble shall be slipped into or over the lead pipe and jointed to it by means of a wiped solder joint. The other end of the ferrule shall then be inserted into the socket of the cast iron or stone ware pipe. In the case of the former, the joints shall be made with molten lead and in the case of the later with cement mortar. Brass screwed cleaning access shall be provided on lead pipes wherever necessary. Lead pipes shall be painted as directed by Engineer.

D.10.6.3 Asbestos Cement Soil, Waste, Vent Pipes and Fittings

D.10.6.3.1 Asbestos cement soil, waste and pipes and fittings shall confirm to IS: 1626. The pipes and fittings shall be of spigot and socket ends and shall be of such nominal diameter as mentioned in the respective item of work. The pipes shall be straight and the ends of the pipes and fittings shall be finished square to their axes. The finished pipes and fittings shall be true and smooth, their inner and outer surfaces being as nearly as concentric. They shall be in all respect sound, homogeneous and free from impurities or other imperfections. The joints for pipes and fittings shall be in cement mortar (1:1) as mentioned in detail for C. I. pipes. The general requirements for fixing a. C. pipes and fittings on wall etc. shall be as described for C. I. soil waste and vent pipes and fittings. All exposed A. C. pipes and fittings shall be painted with two coats of paints approved type, make and colour as specified and directed by Engineer.

D.10.6.4 Salt-Glazed Stoneware Pipes and Fittings

D.10.6.4.1 Salt-glazed stoneware pipes and fittings shall conform to IS: 651. The pipes and fittings shall be of spigot and socket ends and shall be of such grade (A/AA) and internal diameter as mentioned in respective items of work. These shall be sound, free from invisible defects such as fire crack or hair cracks. The glaze of the pipes and fittings shall be free from crazing. The pipes shall give a sharp clear note when struck with alight hammer. There shall be no broken blisters. The length of pipes shall be 60 cm exclusive of the internal depth of socket unless otherwise specified. The pipes and fittings shall be handled with sufficient care to avoid damage to them. In general, laying, jointing and testing of salt-glazed stoneware pipes shall be as per IS : 4127. The pipes shall be laid to the required alignment. Levels and gradient as per the relevant drawings. The socket ends shall face the upstream. The bottom of the trench shall be well compacted before the pipes are laid. Where the pipes are laid on a soft soil, with the minimum water table level lying as the invert level of the pipe or where the pipe line is crossing the road, the pipes shall be bedded in concrete or shall be fully encased as directed or specified in the item of work. The pipes shall be jointed by following procedure:

D.10.6.4.2 In each joint spun yarn soaked in neat cement slurry or tarred gasket shall be placed round the joint and inserted in it by means of a caulking tool. More skeins of yarn or gasket shall be added if necessary and shall be well caulked. Yarn or gasket so rammed shall not occupy more than fourth of the depth of socket. Cement mortar (1:1) (one part of cement to one part of sand) shall be slightly moistened and carefully inserted by hand into the remaining space of the joint after caulking of yarn or gasket. The mortar shall then be caulked into the joint with a caulking tool. More cement shall be added until the space of joint has been completely filled with tightly caulked mortar. The joint shall then be finished off neatly outside the socket at an angle of 45 degrees. The cement mortar joint shall be cured at least for seven days before testing. The backfilling of trenches shall not be undertaken until the joints of the pipes are

thoroughly set and have been inspected, tested and approved by Engineer. The backfilling from the bottom of pipe upto 300 mm above the top of pipe shall be done by selected earth free of any hard material. Care shall be taken not to disturb the joints during backfilling.

D.10.6.5 Gully Trap

- D.10.6.5.1 In case gully trap is required to be provided before the wastewater pipe is connected to inspection chamber, this shall be of salt-glazed stoneware with square mouth and with 'P' or 'S' trap and shall conform to IS : 651. The size of gully trap as well as the brick masonry chamber in which it is fixed shall be as per the respective item of work. Gully trap shall have one C. I. grating of square size. Corresponding to the dimensions of inlet of gully trap. It will also have watertight C. I. cover and frame with inside clear dimensions of 300 mm x 300 mm, the cover weighting not less 5 Kg. And the frame not less than 3 Kg. The grating, cover and frame shall be off sound and good casting and shall have truly square machined seating face. The cover for Gully Trap may be of precast concrete if specified in the item. The gully trap shall be fixed on cement concrete M-100 foundation, 680 mm square and 150 mm thick. The jointing of gully trap outlet to the branch drain shall be done similar to jointing of glazed stoneware pipes. After fixing and testing gully and branch drain, a brick masonry (1:5) shall be built with 115 mm thick brick work round the gully trap from the top of the bed concrete up to ground level. The space between the chamber walls and the trap shall be filled in with cement concrete M-100. The space between the chamber walls and the trap shall be filled in with cement concrete M-100. The upper portion of the chamber i.e. above the top level of the trap and inside face of chamber shall be cement plastered 12 mm thick in C. M. (1:3) finished with a floating coat of neat cement. The corners and bottom of the chamber shall be rounded off so as to slope towards the grating. C. I. cover with frame 300 mm x 300 mm (inside) shall then be fixed on the top of the brick masonry with cement concrete M150 and rendered smooth. The finished top of cover shall be left about 40 mm above the adjoining ground level so as to exclude the surface water from entering the gully trap. The item shall be executed as per the detailed drawing and as directed by Engineer.

D.10.6.6 Inspection Chamber

- D.10.6.6.1 Inspection Chamber shall be provided at every change of alignment, gradient or diameter of sewer/storm water drains, bends and junctions in the sewer / drain shall be grouped together in inspection chamber as far as possible. The maximum distance between inspection chambers shall be about 25 meters. Where the diameter of sewer/drain is increased, the soffit of the pipe shall be fixed at the same level and necessary slope given to the channel of inspection chamber. The minimum internal sizes of inspection chamber shall be as per the respective item of work. The inspection chamber shall be constructed as per the detailed drawings and as directed by Engineer. The bed concrete BBCC (1:5:10) and for channel CC (1:2:4) and the brick masonry shall be constructed of such thickness as shown on drawing. The brick masonry shall be constructed in C. M. (1:5), plastered on both faces with 15 mm cement plaster in C. M. (1:3). The channel shall be semicircular in the bottom half and of diameter equal to the sewer/drain. Above the horizontal diameter, the sides shall be extended vertically to the same level as the crown of the outgoing pipe and the top edge shall be suitable rounded off. The branch channels shall also be similarly constructed with respect to the benching out at their junction with the main channel as appropriate fall suitable

rounded off in the direction of flow in the main channel shall be given. The channel at the bottom of inspection chamber shall be plastered with C. M. (1:1) and finished smooth. Rungs shall be provided in all inspection chambers over 0.6 m in depth and shall be of cast iron conforming to IS: 5455. These rungs shall be fixed staggered in two vertical runs, 300 mm apart horizontally and 300 mm c/c vertically. The top rung shall be 450 mm below the inspection chamber over and the lowest not more than 300 mm above / the benching. The inspection chamber frame and cover and the lowest not more than 300 mm above the benching. The inspection chamber frame and cover shall be of cast iron of specified weight and shall conform to the requirements given in IS: 1726. The covers and frames shall be cleanly cast and they shall be neatly dressed and carefully trimmed. All castings shall be free from voids whether due to shrinkage, gas inclusion or other causes. Covers shall have a raised Chequered design on the top surface to provide an adequate nonslip grip. Cover shall be capable of easy opening and closing and it shall be fitted in the frame in workmanship like manner. The cover shall be gas tight and water tight. The size of covers specified shall be considered as the clear internal dimensions of the frame. Covers and frames shall be coated with a black bituminous composition. The coating shall be smooth and tenacious. The frame of inspection chamber cover shall be firmly embedded to correct alignment and level in cement concrete on the top of the masonry. The item shall be executed as per the detailed drawing as directed by Engineer. Light duty CI seat and cover of required size shall be provided.

D.10.6.7 Intercepting Trap

D.10.6.7.1 Intercepting trap shall be salt glazed earthenware and shall conform to IS: 651. This trap shall be provided in the last manhole/ inspection chamber of building properly before the sewer is connected to street manhole/septic tank as directed and specified in the item of work. This item shall, however, be provided as per the requirements of local authority. The connection to street manhole/septic tank shall be done in good workmanship manner and as per the requirements of local authority.

D.10.7 STORM WATER DRAINAGE SYTEM

D.10.7.1 Rain Water Pipes and Fittings

Cast iron rain water pipes and fittings shall conform to IS: 1230 whereas those of asbestos cement shall conform to IS: 1626. The general requirements of C. I. and A. C. rain water pipes and fittings, their fixing and jointing procedure, painting, etc., shall be as per the details described for respective type of pipes and fittings under the items for drainage work. The rain water pipe shall discharge directly or by means of a channel into or over an inlet to a surface drain or shall discharge freely in compound, drained to surface drain as directed by Engineer. In case the rain water pipe is to be connected to street drain this shall invariably be connected through gully trap. A rainwater pipe shall not discharge into or connect with any soil, waste or ventilating pipe nor shall discharge into a sewer unless specifically permitted to do so by the local authority in which case such discharge into a sewer shall be intercepted by means of gully trap. The diameter, spacing and type of rainwater pipe shall be as per the detailed drawing and respective item of work. A bell mouth inlet at the roof surface be provided with suitable grating. Generally, minimum diameter of rainwater pipe shall be 100 mm unless otherwise specified. Fixing of rain water gutters and down pipes for roof drainage shall conform to the requirements of IS: 2527.

D.10.8 MISCELLANEOUS ITEMS

- D.10.8.1 Miscellaneous items such as special types of plumbing fixtures and fittings not covered in this specification but which are required to be provided as per the items of work shall be of best quality and of approved make. Other items which are invariably provided in sanitary units such as C. P. towel rail, liquid soap holder, mirror, etc., shall be of such size and type as mentioned in respective item of work and shall be of best quality and as approved by Engineer.

D.10.9 TESTING OF PLUMBING SYSTEMS

- D.10.9.1 All pipes, fittings and appliances shall be stated as per the requirements of relevant I.S.S. and/local authority and necessary test certificates shall be submitted by Contractor whenever called for by Engineer at no extra cost to Owner / Engineer.
- D.10.9.2 When water supply system is completed, it shall be slowly and carefully charged with water, allowing all air to escape and avoiding all shock or water hammer. The system shall then be inspected under working conditions of pressure and flow. When all draw-off taps are closed, the service pipes shall be absolutely watertight.
- D.10.9.3 Comprehensive tests of all sanitary appliances shall be made by stimulating conditions of use. Overflows shall also be examined for obstructions.
- D.10.9.4 All soil, waste, vent pipes, fittings and their joints above ground shall be proved perfectly gas-tight by conducting a smoke test under a pressure 25 mm of water and maintained for 15 minutes after all trap seals have been filled with water. The smoke shall be produced by burning oil waste or tar paper or similar material in the combustion chamber of smoke machine. Contractor shall also perform water tests if required by Engineer before the appliances are connected. This test may be carried out in sections so as to limit the state head to 4.5 m. All the openings affected by the test shall be sealed and provided with supports to the plugs, which are used as stoppers during the test. All the pipes, fittings and their joints shall be proved water-tight.
- D.10.9.5 Discharge test shall be performed from all the sanitary appliances, singly and collectively. Obstruction in any of the pipe lines shall be traced and the whole system examined for proper hydraulic performance, including the retention of an adequate water seal in each trap.
- D.10.9.6 After laying and jointing salt glazed stoneware pipes, R.C.C. pipes suitable stretches of pipes inclusive of manhole/chambers shall be subjected to a test pressure of at least 1.5 meters head of water at the highest point of section water test. The tolerances figure of two liters per centimeter of diameter per kilometer shall be allowed during a period of ten minutes.
- D.10.9.7 Rain water pipes and fittings shall be tested to a height of water equivalent to the height of the building plus 3 meters to ensure no leakage in case of choking the pipe, by first installing test plugs in all openings, erecting 3 meters long stand pipe and filling the entire system with water. Pipes shall be deemed to have passed the test, if water levels in the stand pipe remains reasonably constant for a period of one hour.

D.10.10 MEASUREMENT

- D.10.10.1 Unless otherwise stated, all pipes such as C.I., G.I., lead, etc. shall be measured net, length as actually laid or fixed shall be measured over all fittings, like bends, tees, junctions, etc.(which shall not be measured separately), in running meters correct to a cm. The length shall be taken along the centre line of the pipes and fittings. No allowance shall be made for any wastage etc. The rate shall include the cost of material and labour involved and inclusive of laying, jointing, testing necessary excavating and backfilling, shoring, dewatering, etc. complete for pipes for laid below ground. In case the pipes are laid above ground the rate shall include the cost of material and labour involved and inclusive of fixing, jointing, testing, painting, necessary scaffolding, cutting through walls, floors, etc. and making good the same etc. complete. This shall however, not include concealed pipe work in which case the length of pipes and fittings concealed shall be measured and paid separately.
- D.10.10.2 The lengths of salt glazed stoneware pipes shall be measure in running metres nearest to a cm as actually laid from inside face of one manhole / chamber to the inside face of the other manhole/ chamber. The length shall be taken along the centre line of the pipes over all fittings such as bends, junction, etc. shall not be measured separately.
- D.10.10.3 All valves (sluice, gate, globe, check etc.) and taps (bib, stop, pillar, etc.) and similar fittings used for water supply system shall be enumerated and paid separately unless otherwise included in the items of work for sanitary appliances. The rate shall include the cost of materials and labour involved inclusive of fixing, testing, etc. complete.
- D.10.10.4 Sanitary appliances such as water closets, urinals, wash basins, sinks etc. shall be enumerated and shall cover all the relevant items as described in respective items of work for sanitary appliances. The rate shall include the cost of materials and labour involved inclusive of supporting fixing, testing, making necessary connections etc. complete.
- D.10.10.5 Gully traps, floor traps, intercepting traps, etc. shall be separately enumerated as per their sizes and shall cover all the relevant items as described in the respective items of work for traps. The rate shall include the cost of materials and labour involved inclusive of fixing the traps, necessary chamber, excavation, backfilling, dewatering, testing, etc. complete.
- D.10.10.6 Manholes and inspection chambers shall be separately enumerated as per their sizes and shall cover all the relevant items as described in the respective items of work for manhole/inspection chamber. The depth of the manhole shall be reckoned from the top level of C. I. /precast R.C.C. cover to the invert level of channel. The depth shall be measured correct to cm. The extra depth shall be measured as an extra over the specified depth in the enumerated item, and paid in running metre under separate item following the main item. The rate shall include the cost of materials and labour involved inclusive of necessary excavation, backfilling, dewatering, testing etc. complete.
- D.10.10.7 Rain water pipe and fittings shall be measured in running meters correct to a cm, the length being taken along their centre line. The rate shall include the cost of materials and labour involved inclusive of fixing, joint, painting, etc.

D.10.11 NAHNI TRAP

D.10.11.1 Materials:

- D.10.11.1.1 Nahni trap shall be of cast iron and shall be sound and free from porosity or other defects which affect serviceability. The thickness of the base metal shall not be less than 6.5 mm. The surface shall be smooth and free from craze, ships and other flaws or any other kind of defects which affect serviceability. The size of nahni trap shall be as specified and shall be self cleaning design.
- D.10.11.1.2 The nahni trap shall be of quality approved by the Engineer in charge and shall generally conform to the relevant Indian Standards.
- D.10.11.1.3 The Nahni trap provided shall be with deep seal, minimum 50 mm, except at places where trap with deep seal can not be accommodated. The cover shall be cast iron. Perforated cover shall be provided on the trap of appropriate size.
- D.10.11.1.4 The C.I. hinged of screwed down cover shall be of best quality.

D.10.11.2 Workmanship:

- D.10.11.2.1 The Nahni trap with 100 mm. dia. inlet and 50 mm. dia. outlet shall be fixed as per drawing or as directed.
- D.10.11.2.2 The Nahni trap shall be jointed with C. I. pipe, 75 mm. dia. with lead joints. The lead joints shall be done in confirmation with IS 782-1976.

D.10.11.3 Mode of measurements & payment:

- D.10.11.3.1 The rate includes cost of all labour, materials, tools and plants etc. required for satisfactory completion of this item including lead jointing and testing.
- D.10.11.3.2 The rate shall be for a unit of one number.

D.10.12 ALUMINIUM WATER LEVEL INDICATOR

The float shall be made of S.S. and it shall be connected to pointer by stainless steel cord. The scale shall be so positioned that it shall be readable from MCC room. The scale shall be made of Aluminum and painted in white but small mark gradations with black. The pointer shall be painted red. The horizontal moment of the float shall be restricted by two guide wire ropes firmly anchored to the tank bottom and kept under permanent tension by spring tensioners.

Adequate support shall be provided to load at suitable position so that it will not sag.

D-11: CONSTRUCTION OF MANHOLES, CHAMBERS AND VENT SHAFTS

SECTION: D-11

D.11.1 SCOPE

D.11.1.1 This specification covers the requirements for providing and constructing ancillary works such as manholes, scraper manholes, vent shaft etc.

D.11.2 APPLICABLE CODES

D.11.2.1 The following standards/codes, unless otherwise specified herein, shall be referred. In all cases, the latest revision of the standards/codes shall be referred to. If requirements of this specification conflict with the requirements of the codes and standards, this specification shall govern.

D.11.2.2 Code for Materials

- (a) IS: 210 - Specification for grey iron castings
- (b) IS: 269 - Specification for ordinary and low heat portland cement
- (c) IS: 383 - Specification for coarse and fine aggregates from natural sources for concrete
- (d) IS: 432 - Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement
- (e) IS: 516 - Methods of tests for strength of concrete
- (f) IS: 651 - Specification for salt-glazed stoneware pipes and fittings
- (g) IS: 1077 - Specification for common burnt clay building bricks
- (h) IS: 1728 - Specification for cast iron manhole covers and frames
- (i) IS: 1786 - Specification for high strength deformed steel bars and wires for concrete reinforcement
- (j) IS: 2116 - Specification for sand for masonry mortars
- (k) IS: 3495 - Methods of tests of burnt clay building bricks
- (l) IS: 5455 - Specification for cast iron steps for manholes

D.11.2.3 Codes of practice

- (a) IS: 456 - Code of practice for plain and reinforced concrete
- (b) IS: 2212 - Code of practice for brickwork
- (c) IS: 2250 - Code of practice for preparation and use of masonry mortars
- (d) IS: 4111 - Code of practice for ancillary structures in sewerage system – manholes
- (e) IS: 4127 - Code of practice for laying of glazed stoneware pipes

D.11.3 MANHOLES

D.11.3.1 Location

Manholes shall be constructed at places as shown on relevant drawings (the detailed drawings will be furnished during execution of the work) and as directed by the Engineer-in-charge.

D.11.3.2 Excavation

Excavation, shoring, dewatering etc. for the pits of manholes shall be done in accordance with specification given in Section D-1, D-2 and D-3 for excavation, shoring and dewatering and specification given in Section D-11 for laying of pipes and fittings/specials. The rate quoted for manhole shall be inclusive of excavation and backfilling, bailing out water and shoring.

D.11.3.3 Bed Concrete

The bed concrete for manholes shall be done in accordance with specification given in Section D-6 for concrete work. The concrete grade is 1:4:8.

D.11.3.3.1 Top slab concrete

Precast reinforced concrete slab shall be casted on top of manhole.

D.11.3.4 Bricks

D.11.3.4.1 Bricks used for construction of manholes shall conform to the relevant Indian Standards. They shall be sound, hard, and homogeneous in texture, well burnt in kiln without being vitrified, table moulded, deep red, cherry or copper coloured, of regular shape and size and shall have sharp and square and parallel faces. The bricks shall be free from pores, chips, flaws or humps of any kind. Bricks containing unground particles and/or which absorb water more than $1/6^{\text{th}}$ of their weight when soaked in water for twenty-four hours shall be rejected. Overburnt or underburnt bricks shall be liable to rejection. The bricks shall give a clear ringing sound when struck and shall have a minimum crushing strength of 35 Kg/sq.cm. Unless otherwise noted in drawings. The class and quality requirements of bricks shall be as laid down in IS: 1077.

D.11.3.4.2 The size of the brick shall be 23.0 x 11.5 x 7.5 or unless otherwise specified; but tolerance upto (\pm) 3 mm. in each direction shall be permitted. Only full size brick shall be used for masonry work. Brick bats shall be used only with the permission of the Engineer-in-charge to make up required wall length or for bonding. Sample bricks shall be submitted to the Engineer-in-charge for approval and bricks supplied shall conform to approved samples. If demanded by the Engineer-in-charge, brick sample shall be got tested as per IS: 3495 by Contractor at no extra cost to the client. The bricks rejected by the Engineer shall be removed from the site of works within 24 hours.

D.11.3.5 Cement Mortar

- D.11.3.5.1 Mortar for brick masonry shall be prepared as per IS: 2250. Manholes shall be constructed in brick masonry with cement mortar (1:4), 20 mm thick inside plaster with plasticized water proofing material consisting of 12 mm thick backing coat in in CM 1:3 and 8 mm thick finishing coat in CM 1:1 and 15 mm thick outside plaster in CM 1:3, unless otherwise specified in items. Gauge boxes for sand shall be of such dimensions that one bag containing 50 Kg. of cement forms one unit. The sand shall be free from clay, shale, loan, alkali and organic matter and shall be of sound, hard, clean and durable particles. Sand shall be as approved by Engineer-in-charge. If so directed by the Engineer-in-charge sand shall be thoroughly washed, till it is free of any contamination.
- D.11.3.5.2 For preparing cement mortar, the ingredients shall first be mixed thoroughly in dry conditions. Water shall then be added and mixing continued to give a uniform mix of required consistency. Cement mortar shall be used within 25 minutes of mixing. Mortar left unused in the specified period shall be rejected.
- D.11.3.5.3 Contractor shall arrange for test on mortar samples if so directed by the Engineer-in-charge. Retempering of mortar shall not be permitted.

D.11.3.6 Brick Masonry

- D.11.3.6.1 All bricks shall be thoroughly soaked in clean water for atleast one hour immediately before being laid. The cement mortar for brick masonry work of manholes shall be in the proportion specified in 3.5.1. Brick work 230 mm. thick and over shall be laid in English Bond unless otherwise specified. 115 mm thick brick work shall be laid with stretchers. For laying bricks, a layer of mortar shall be spread over the full width of suitable length of the lower course. Each brick shall be pressed into the mortar and shoved into final position so as to embed the brick fully in mortar. Bricks shall be laid with frogs uppermost.
- D.11.3.6.2 All brickwork shall be plumb and square unless otherwise shown on drawing and true to dimensions shown. Vertical joints in alternate courses shall come directly one over the other and be in line. Horizontal courses shall be levelled. The thickness of brick courses shall be kept uniform. For walls of thickness greater than 230 mm both faces shall be kept in vertical planes unless otherwise specified. All interconnected brickwork shall be carried out at nearly one level (so that there is uniform distribution of pressure on the supporting structure) and no portion of the work shall be left more than one course lower than the adjacent work. Where this is not possible, the work shall be raked back according to bond (and not saw toothed) at an angle not exceeding 45 degrees. But in no case the level difference between adjoining walls shall exceed 1.25 m. Workmanship shall conform to IS: 2212.
- D.11.3.6.3 Brick shall be so laid that all joints are well filled with mortar. The thickness of joints shall not be less than 6 mm and not more than 10 mm. The face joints shall be raked to a minimum depth of 12 mm by raking tools daily during the progress of work when the mortar is still green, so as to provide a proper key for the plastering to be done. When plastering is not required to be done, the joints shall be uniform in thickness and be struck flush and finished at the time of laying. The face of brickwork shall be cleaned daily and all mortar droppings removed. The surface of each course shall be

thoroughly cleaned of all dirt before another course is laid on top. If mortar in the lower courses has begun to set, the joints shall be raked out to a depth of 12 mm before another course is laid. No extra payment will be made for raking joints.

D.11.3.7 Cement Plaster

- D.11.3.7.1 All joints in masonry shall be raked to a depth of 12 mm. with a hooked tool made for the purpose when the mortar is still green and in any case within 46 hours of it laying. The surface to be rendered shall be washed with fresh clean water free from all dirt, loose material, grease etc. and thoroughly wetted for 6 hours before plastering work is commenced. Concrete surfaces to be rendered will however be kept dry. The wall should not be too wet but only damp at the time of plastering. The damping shall be uniform to get uniform bond between the plaster and the wall.
- D.11.3.7.2 The proportion of the cement mortar shall be as specified on relevant drawings. Cement shall be mixed thoroughly in dry condition and then just enough water added to obtain a workable consistency. The quality of water, sand and cement shall be as per relevant I.S. The mortar thus mixed shall be used immediately and in no case shall the mortar be allowed to remain for more than 25 minutes after mixing with water.
- D.11.3.7.3 Curing of plaster shall be started as soon as the applied plaster has hardened enough so as not to be damaged. The decision as to when the plaster has hardened, will be given by the Engineer-in-charge. Curing shall be done by continuously applying water in fine spray and shall be carried out for at least 7 days.
- D.11.3.7.4 Plastering shall be done on both faces of brick masonry, 20 mm thick inside and 15 mm thick outside.

D.11.3.8 Cement concrete channel

- D.11.3.8.1 The channel for the manhole shall be constructed in cement concrete of M15 grade. Both sides of the channel shall be taken up to the level of the crown of the outgoing sewer. They shall be benched up in concrete and rendered in cement mortar (1:1) of 20 mm thickness and formed to a slope of 1 in 12 towards the channel.

D.11.3.9 Pipe entering or leaving manhole

- D.11.3.9.1 Whenever a pipe enters or leaves a manhole, bricks on edge must be cut to a proper form and laid around the upper end of the pipe so as to form an arch. All around the pipes, there shall be a joint of cement mortar (1:2) 13 mm thick between it and the bricks.

D.11.3.10 Plastic moulded reinforced steps

- D.11.3.10.1 Plastic moulded reinforced steps shall be as per IS 5455. The steps shall be of 8 mm TOR steel bar conforming to IS 1786 and Fe 415 grade with plastic polypropylene (P.P.) material (vergin).

Casting shall be of polypropylene conforming to an ASIM D 4101. The moulding shall be injection moulded.

D.11.3.11 Frame and covers

D.11.3.11.1 Frame and covers for manholes shall be of required type and dimensions as per the relevant drawings and as specified in Data Sheet – III. Following information shall be clearly marked on each cover.

- (a) Year of manufacture
- (b) Identification mark of the purchaser
- (c) SEWER / SWD
- (d) Arrow showing direction of flow
- (e) Name of manufacturer / Trade mark

D.11.3.11.2 Cast iron frame and cover

The cast iron frame and cover shall be of grey cast iron as per IS: 1728. The general requirements for casting and coating of CI frame and cover shall be as specified for CI steps in Clause D.11.3.10.1. The covers shall have a raised Chequered design to provide an adequate non-slip grip. The rise of the chequer shall be not less than 4 mm. The locking device for cover shall be not less than 4 mm. The locking device for cover shall be provided as directed by the Engineer-in-charge. The CI covers for load test shall be selected at one for every lot of fifty or part thereof for each type and size manufactured and as directed by the Engineer-in-charge. The frame shall be fixed in cement concrete of M15 grade all round and finished with neat cement. The manhole frame shall have 580 mm diameter clear opening and shall weigh not less than 100 Kg. including cover. In case of rectangular CI frame and cover of 900 mm x 600 mm clear opening, the total weight shall not be less than 275 Kg.

D.11.3.11.2 Fiber Reinforced Concrete Frame and Cover

Fiber reinforced concrete frame and cover shall be capable of withstanding load of 20 tonnes. The frame shall be fixed in cement concrete of M20 grade all around and finished with neat cement. The fibre reinforced frame shall have clear opening of 800 mm diameter. The frame and cover shall have a minimum weight of 128 Kg. The fibres shall constitute 1% of the weight of the concrete in the form of 50 mm to 100 mm long high tensile steel wires. For the cover, MS sheet lapping of 16 gauge shall be provided to avoid damage to the edges. Similarly for frame, MS angle / flat shall be provided along the edge. Both MS sheet and angle shall be painted with black bituminous paint. The cover should have suitable lifting arrangement. The fiber reinforced frame and cover shall be manufactured as per the drawing approved by the Engineer-in-charge. The size, type, weight and locking arrangement for frame and cover shall be as specified in items.

D.11.3.11.3 Reinforced Cement Concrete Frame and Cover

Reinforced cement concrete frame and cover for manholes shall be of required dimensions and shape as shown on drawing and as specified in Data Sheet – III. The frame and cover shall be cast in cement concrete of M20 grade. Minimum cover to the reinforcement shall be 40 mm. The edges of frame and covers shall be provided with

mild steel angles to avoid damages to the corners. These angles shall be painted with black bituminous paint. The covers should have suitable lifting arrangement.

D.11.3.12 Drop Manhole

- D.11.3.12.1 When a sewer connects a main sewer, and where the difference in level between water line (peak flow levels) of main line and the invert level of branch line is more than 600 mm or a drop of more than 600 mm is required to be given in the same sewer line and it is uneconomical or impractical to arrange the connection within 600 mm, a drop connection shall be provided for which a manhole shall be constructed as per relevant drawing, incorporating a vertical drop pipe from the higher sewer to the lower one. This pipe shall be provided outside the shaft and encased in concrete. A continuation of the branch sewer should be built through the shaft wall to form a rodding and inspection eye, which should be provided with a half blank flange. The diameter of the back drop should be at least as large as that of the incoming pipe. The drop pipe should terminate at its lower end with a plain or duck-foot bend turned so as to discharge its flow at 45 degrees or less to the direction of the flow in the main sewer. The pipe unless of cast iron should be surrounded with 150 mm thick concrete.
- D.11.3.12.2 In the case of sewers over 450 mm in diameter the drop in level may be accomplished by one of the following methods as shown on relevant drawings
- (a) A cascade
 - (b) A ramp
 - (c) By drops in previous manholes

D.11.3.13 RCC Manhole

- D.11.3.13.1 In general, plain and reinforced concrete work for manholes shall be carried out in accordance with the specification shown in Section D-6 unless otherwise specified in this specification. The top slab of manhole shall be cast with shutters lined with plywood and shall be smooth finished. For avoiding surface cracks due to variation in atmosphere temperature and exposure to direct sunlight, RCC slab of manholes after casting shall be kept wet. If M20-25 grade of concrete used for construction of RCC manhole shall have minimum cement content of 330 Kg/cum of concrete. Reinforcement used for construction of manhole will be TMT – CRS as per relevant specification given in the tender document. Minimum cover to the reinforcement shall be 40 mm.

D.11.4 VENT SHAFTS

D.11.4.1 General

- D.11.4.1.1 Vent shafts shall be erected at such places as shown on relevant drawings (the detailed drawings will be furnished during execution of the work) and as directed by the Engineer-in-charge.

D.11.4.2 Mild steel vent shaft

- D.11.4.2.1 Mild steel vent shaft shall be of 150 mm diameter and 12.17 m. height from ground level with C. I. Ornamental cap. This shall be fixed firmly and encased in cement concrete of M15 grade as shown on relevant drawing with necessary mild steel bolts,

plates etc. for foundation. The vent shaft shall be painted with one coat of silver paint over two coats of red lead oxide paint. The vent shaft shall be connected to manhole by 150 mm diameter glazed stoneware pipe encased by M10 concrete of 150 mm thickness all around as per drawing and as directed by Engineer-in-charge.

D.11.4.3 RCC vent shaft

- D.11.4.3.1 Reinforced cement concrete vent shaft shall be of M20 grade concrete, 200 mm diameter at bottom and tapered to 100 mm diameter at top (both inside clear openings) and 6 m height from ground level. The vent shaft shall be embedded in concrete of M10 grade and anchored by 2 Nos. of 16 mm diameter and 600 mm long MS bars as per the relevant drawing. The vent shaft shall be connected to manhole as specified in clause D.11.4.2 of this specification through a brick masonry flue chamber as per relevant drawing.

D.11.4.4 Jointing Stoneware Pipes

- D.11.4.4.1 The salt glazed stoneware pipes and fittings shall conform to IS: 651. The spigot and socket joints of stoneware pipes shall be of rigid type and shall be caulked with tarred gasket (prepared ready for use before being brought on the work) in one length for each joint and sufficiently long to entirely surround the spigot end of the pipe. The gasket should be driven upto one fourth depth of socket by means of caulking tools. After the pipes are thoroughly cleaned and moistened, mixture of one part of cement and one part of clean fine sand tempered with just sufficient water to have a consistency of semi-dry condition should be forced into the joint and well rammed with caulking tools, so that the whole space around the spigot and socket is completely filled with lightly caulked mortar and the joints shall be finished off with a splayed fillet sloping at 45 degrees to the side of the pipe. The joint shall be thoroughly cured. The laying, jointing and testing of stoneware pipes and fittings shall be as per IS: 4127.

D.11.4.5 Measurement

D.11.4.5.1 Manholes

- D.11.4.5.1.1 The payment for manhole will be made on No. basis of relative item mentioned in Schedule-B of Volume-II of the Contract.

D.11.4.5.2 Vent shafts

- D.11.4.5.2.1 The rate quoted in Schedule of Quantities and Rates for mild steel vent shaft shall deem to include the cost of vent shaft with C. I. Ornamental cap and / or base including M. S. bolts and plates, necessary excavation, dewatering, backfilling, foundation, stoneware pipe connection to manhole inclusive of concrete encasement, painting, erecting etc. complete. The measurement for vent shaft shall be per number basis. The measurement for vent shaft shall be per number basis.

D.11.4.5.3 Notes

- D.11.4.5.3.1 If any damage is caused to the other services such as water supply pipeline, sewer, cable etc. during the construction of manholes and erection of vent shafts, Contractor

shall be held responsible for the same and shall replace the damaged services at his own cost to the full satisfaction of the Engineer-in-charge.

D.11.4.5.3.2 The interior of manholes shall be cleared of all debris after construction and before testing the same for water tightness by Contractor at his own cost.

D.11.4.5.3.3 Water for testing of manholes along with pipeline shall be arranged by Contractor at his own cost.

D-12: SPECIFIC TECHNICAL REQUIREMENTS FOR CONSTRUCTION OF WATER DISTRIBUTION STATION AND ALLIED WORKS

SECTION: D-12

D.12.1 SCOPE

- D.12.1.1 This section specified the specific technical requirements for construction of sewage pumping station and allied works. This section and other specifications of Section – D are mutually dependent and essential for correct interpretation of the contract. In case of conflict in any of these specifications, the requirements of this section shall govern.

D.12.2 EXCAVATION

- D.12.2.1 Before excavation, the setting out of sewage pumping station and alignment of pipelines at site shall be approved by Client / Engineer. The excavation shall be carried out in accordance with the specification given in Section – D1. All excavation works for construction of sewage pumping station may be carried out manually unless, in the opinion of engineer, the work involved and time schedule required use of mechanical equipment.
- D.12.2.2 All precaution shall be taken during excavation and construction to guard against possible damage to any existing structure / pipelines etc. also utmost care shall be taken to prevent wide collapses during excavation. No payment for removal of any collapsed earth shall be made.
- D.12.2.3 Contractor shall provide suitable barricade, fencing on all sides of excavation for its full length / perimeter. Also necessary construction signs, red lanterns and guards as required shall be provided and maintained during the progress of construction and pipe laying work.
- D.12.2.4 Stable side slopes to excavation shall be provided wherever permitted by Engineer. The side slopes for excavation towards the building side having independent foundations shall be as steep as possible so as to avoid keep column footings. The side slopes shall be as directed by Engineer. Engineer's approval for side slopes during excavation shall not relieve Contractor from his responsibility for any damage or subsidence. Where side slopes are not feasible and / or not permitted by Engineer, Contractor shall provide suitable shoring and strutting for excavation. Contractor shall suitably design polling boards, walings and struts to meet the different soil conditions that might be encountered in excavating trenches or pits. The horizontal and vertical spacing of struts shall be prevented from collapse but also ease of laying of pipes / construction of structure in trenches / pits shall be ensured without creating undue obstructions for the execution of the work. Any inconvenience and / or delay that might be caused in laying of pipe / construction in trenches / pits as a result of adopting improper spacing of struts by Contractor shall be his sole responsibility.
- D.12.2.5 If during excavation, any soft or loose soil is met with under the substructure, it shall be immediately informed to Engineer and remedial measures taken as directed by Engineer.
- D.12.2.6 The material from excavation shall be deposited at such places as directed by Engineer leaving adequate clear distance from the edge of the trench / pit as may be necessary to prevent the sides of the trench / pit from slipping or collapsing. The basic lead for disposal of excavated material shall be 30 m for pipeline work and 50 m for construction of SPS

work as against 100 m mentioned in Section – D1, Earthwork in Grading, Excavation and Backfilling.

- D.12.2.7 Service lines met with during excavation shall be properly maintained by Contractor by means of shoring, strutting, planking over, padding or otherwise as Client / Engineer may direct and shall be protected by Contractor from damage during the progress of the work and if damaged, such damage shall be made good either by Contractor or by other agency, as Client / Engineer may decide and wholly, in either case, at the expenses of Contractor. Supports for pipes above 150 mm diameter and to high tension cables shall be paid separately only if special measures have been taken to support the above services by Contractor and deemed fit by the Engineer.
- D.12.2.8 Utmost care shall be taken to see that width of trench at the top of pipe is not more than that specified in Data Sheet A of Section – D. In case additional width is required it shall be provided only in the top portion from the ground level up to 300 mm above the top of pipe. If any extra width is excavated in the area below this portion Contractor shall have to provide remedial measures as directed by Engineer. Contractor shall not be paid for extra excavation as well as for any remedial measures.
- D.12.2.9 In case of excavation of existing roads, the road metal and also the rubble packing shall first be stripped off for the whole width of the trench pit and separately deposited in such place or places as may be deposited in determined by Engineer. In case of the metal packing or khandakies not being so deposited or being mixed up with excavated material and not being available for making good the road surface, the cost of the new metal packing or khandakies as required shall be charged to the Contractor. Excavation in asphalt / concrete road or pavement of any thickness shall be considered as separate item for payment as provided for Schedule of Quantities and Rates. Such work shall neither be part of excavation in hard rock or soft rock as mentioned in Section – D1, Item 7.1 (b) and 7.1 (c) respectively.
- D.12.2.10 The excess excavated material shall be carried away from sites of works to a place up to distance specified in Schedule of Quantities as directed by Client / Engineer so as not to cause any inconvenience to other agencies, failing which, Client / Engineer shall carry out the work by any other agency at Contractor's risk and cost. If the instructions from Engineer are not followed within seven days from the date of instructions, to cart the materials and to clear the site, the same shall be carried out by Client / Engineer at the risk and cost of Contractor and no claim or dispute shall be entertained in this respect.
- D.12.2.11 Excavation with side slopes and suitable berms as approved by Engineer shall be measured and paid.

D.12.3 DEWATERING

- D.12.3.1 Contractor should take into account the subsoil and ground water conditions, which may be encountered, particularly the running sand conditions at work site and shall adequately allow for shoring / strutting and dewatering by pumping.
- D.12.3.2 Drainage channels and sumps shall be provided in the pit to drain all surface and ground water by pumping. Contractor shall dewater and maintain excavated pits dry at all times by use of dewatering sump pumps including ancillary equipment for the construction of substructure SPS during actual excavation; laying PCC and RCC, inspection, testing and

backfilling etc. or as directed by Engineer at the site where inflow of ground water in the opinion of Engineer obstructs the progress of work, leads to unsanitary conditions by stagnation, retards the speed of construction, is detrimental to the safety of workers, materials, structure, equipment and such other causes. The ground water level shall be lowered well below the founding level to provide dry firm working conditions and to prevent sand boiling or bottom heave with consequent loss of bearing capacity. Heavy pumping in excavation which may result in removal of fine material from soil shall be avoided. Contractor shall ensure that there is no damage to existing adjoining structures due to dewatering operations. Contractor shall also make necessary arrangements for the disposal of drained water to nearby storm water drain or nullah if allowed by Engineer or upto a lead of 100 m from excavated trench / pit as directed by Engineer. In no case removal of water shall be allowed to spread over the adjoining area.

D.12.3.3 Contractor shall exercise his own judgement regarding the extent of pumping required and approximate size of dewatering pumps as other facilities required to keep the excavation dry. Contractor shall submit his scheme and also indicate sequence of operation, limits of excavation and the capacity and other details of the equipment and accessories he intends to use for dewatering during the construction and the number, capacity and location of pumps etc. The Contractor shall bring to site only such equipment and accessories, which are approved by Engineer in writing. The contractor shall provide adequate standby arrangement for pumping in case of electric power failure / mechanical failure.

D.12.3.4 The payment whatsoever shall be made for dewatering as per the items specified in bill of quantities, if required to be done during excavation, laying PCC and construction of RC substructure upto the plinth level, laying and jointing of pipes, construction of manholes, inspection, testing and backfilling etc. and Contractor should quote accordingly.

D.12.4 BACKFILLING

D.12.4.1 Backfilling all around the substructure of SPS shall be done in equal successive layers by watering, ramming and consolidating in layers of 15 cm after obtaining permission from Engineer to backfill. Trenches shall be back filled with approved selected excavated material only after successful testing of the pipeline. The tamping around the pipe shall be done by hand or other hand operated mechanical means. The water content of the soil shall be as near the optimum moisture content as possible. Filling of the trench shall be carried out simultaneously on both sides of pipe in such a manner that unequal pressure does not occur. Backfilling shall be done in layers not exceeding 30 cm. Each layer shall be consolidated by watering, ramming, care being taken to avoid damage to pipeline.

D.12.5 PLAIN AND REINFORCED CONCRETE

D.12.5.1 In general, plain and reinforced concrete work for construction of sewage pumping station shall be carried out in accordance with the specification mentioned in Section – D6 unless otherwise specified in this specification.

D.12.5.2 Mix design and testing, shall be as per clause No. D.6.7.2.1 of Specification mentioned in Section – D6, is applicable only to reinforced concrete. For concrete used in manholes, encasing of pipes, supports, blinding layer in foundation etc. such tests may be called for at the discretion of Engineer.

- D.12.5.3 The size of aggregates for concreting of raft shall be 40 mm downgraded and for other concreting items this shall be 20 mm downgraded.
- D.12.5.4 The inside and outside faces of walls of substructure shall be cast with shutters lined with plywood and shall be smoother finished as per clause D.6.8 of above mentioned specification.
- D.12.5.5 The exposed faces of other RCC members shall be cast with shutters lined with plywood and shall have smooth finish and with rough board finish at other locations.
- D.12.5.6 Through bolts or ties for formwork shall not be allowed and the formwork shall be suitably supported by studs, walers, braces, ties, straps, shores etc. to hold the forms in proper position without any distortion whatsoever, until the concrete has set sufficiently to permit removal of forms. The lift for vertical walls shall be about 2 m unless otherwise shown on drawing.
- D.12.5.7 Casting of panels for raft and vertical walls shall be done as per the sequence shown on relevant drawings.
- D.12.5.8 The interval between successive vertical concrete pours in any wall panel shall be minimum 3 days. Casting of adjacent floor / wall panels shall be done after an interval of 7 days. While casting the raft utmost care shall be taken by Contractor to see that the dowels for pump foundations are placed at exact location as shown on the drawing. Also vertical walls shall be cast only after all the pipes / plate inserts are placed at proper location as shown on drawing and as approved by Engineer.
- D.12.5.9 M25 grade of concrete used for construction of substructure of sewage pumping station inclusive of screen chamber and inlet chamber below plinth level shall have minimum cement content of 365 kg/cu.m. of concrete. In case as per mix design the cement required is more than 365 kg/cu.m of concrete, Contractor shall have to provide the same at his cost. For construction of superstructure M20 grade of concrete shall be used as per the mix design.
- D.12.5.10 To avoid surface cracks due to variation in atmospheric temperature and exposure to direct sunlight, exposed faces of substructure shall be kept wet by frequent spray of water or by saturated coverings till testing and backfilling is carried out. Contractor should take this aspect into consideration and quote accordingly. No extra claim on this account shall be entertained.
- D.12.5.11 Ends of panels cast first shall be provided with grooved keys and synthetic grade rubber water stops (Caper stops or equivalent water stop), as shown on detailed construction drawings. Contractor shall ensure thorough vibration of concrete around the water stops. 225 mm wide water stops shall be provided in raft and 150 mm wide water stops in walls.
- D.12.5.12 All inserts required to be provided by Contractor shall be fixed by him during casting of structural members. Details and locations of such inserts shall be as per the relevant drawing.
- D.12.5.13 The pockets required for fixing sluice gates, trash screens, pumps, motors etc. shall be provided as per detailed drawing.

- D.12.5.14 Bar bending schedule for reinforcement shall be prepared by Contractor and got approved from Engineer-in-charge before proceeding with the work.
- D.12.5.15 An unaccountable wastage for issued steel reinforcement upto 2% will be allowed for reconciliation.

D.12.6 TESTING OF SUBSTRUCTURE FOR WATERTIGHTNESS

- D.12.6.1 After constructing the substructure up to plinth level and before backfilling is done all around the substructure, Contractor shall test the wet well and inlet chamber as described below for water tightness. The leakage, if any, shall be observed from outside and shall be rectified by pressure grouting at no extra cost to Client / Engineer. After successful testing rectification of any leakages observed during above test, backfilling shall be done around the wet wells a dry wells. Leakage, if any, shall be observed from inside the dry well and rectified as mentioned above.
- D.12.6.2 The wet well shall be separately tested for water tightness by filling it with water up to formation level after temporarily closing the CI puddle pipes provided for suction. Seven days after the filling, the level of water shall be recorded again at subsequent intervals of 24 hours over a period of next seven days. The total drop in surface level over the second period of seven days shall be taken as an indication of the water tightness of the wet well. The wet well shall be deemed to be watertight if the total drop in the surface level over the second period of seven days does not exceed 40 mm. If the wet well does not satisfy this condition and the daily drop in water level shown decreasing trend, the period of test may be extended for further seven days and if specified limits is then reached, the structure may be considered as satisfactory. Otherwise Contractor has to take necessary measures to make the wet well watertight to the satisfaction of Engineer and at no extra cost to Client / Engineer.

D.12.7 GROUTING FOR SUCTION PIPES

- D.12.7.1 Opening of required dimensions shall be provided by contractor at the exact locations shown on relevant drawing during the casting of wall between wet well and dry well. The CI pipes and fittings for suction and delivery shall be supplied and erected by mechanical contractor. After the approval of water tightness test for wet well and after the installation of above CI pipes and fittings by mechanical contractor, the contractor shall grout the annular space between the openings and CI suction pipe as per the detailed specifications for special grout given Section – D. The contractor shall ensure perfect water tightness of this annular grout and in case any leakage is observed he has to rectify it at his own cost to the complete satisfaction of Engineer.

D.12.8 SUPPORT FOR H.O.T. CRANE

- D.12.8.1 The beams for supporting H.O.T crane shall be constructed in perfect line and M.S. plate inserts and bolts shall be embedded at locations as shown on drawing for fixing rails.

D.12.9 INLET CHAMBER

- D.12.9.1 The inlet chamber of sewage pumping station includes sluice gate and screen chamber shall include manually operated fixed screen. Sluice gate and the fixed screens shall be supplied and erected by contractor as per specifications. Necessary pockets / plate inserts

etc. shall be provided at required locations by contractor as per the detail drawing and as directed by Engineer.

D.12.10 BUILDING WORK

D.12.10.1 Ventilation Duct

D.12.10.1.1 Ventilation duct is to be provided for dry well with the RCC jali above the plinth level. The RCC jali shall be as shown on drawing and approved by Engineer.

D.12.10.2 MCC Room

D.12.10.2.1 PVD (Vinyl) asbestos floor tiles in MCC room shall be laid only after all the equipments are erected in these rooms.

D.12.11 CIVIL STRUCTURE – GENERAL

D.12.11.1 Contractor shall co-operate with other agencies working in our near the sewage pumping station. Any damage caused by Contractor to the structure, sanitary fixtures, electrical and mechanical equipment etc. shall be made good and resorted to its original condition / or replaced at no extra cost to Client / Engineer. Final coat of painting shall be done after all the mechanical and electrical equipments are tested and commissioned.

D.12.11.2 Contractor shall rectify all defects in civil works during the defects liability period.

D.12.12 R.C.C. PIPES

D.12.12.1 RCC pipes and collars shall strictly conform to I.S. 458. The internal diameter, type, class and three edge bearing strength of pipes shall be as per Sata Sheet – A of Section – D.

D.12.12.2 The pipes shall be laid perfectly true both in alignment and gradient on specified bedding as shown on relevant drawing. The type of joint and the cement mortar proportions for jointing of pipes shall be as per Data Sheet – A of Section D.

D.12.12.3 RCC pipes after jointing inclusive of manholes shall be tested for water tightness in suitable stretches before backfilling excavated earth, as per Clause No. D.13.7.1 and D.13.7.2 of specification given in Section – D13 for Reinforced Cement Concrete Pipes.

D.12.13 MANHOLES

D.12.13.1 Manhole frame and cover shall be of heavy-duty fibre reinforced concrete type with 560 mm clear opening and shall weigh total 180 Kg.

D.12.13.2 The measurement for brick masonry manholes shall be as per Clause No. D.7.5.1 of specification given in Section D-7 inclusive of cost of RCC slab with necessary formwork but exclusive of requirement.

D.12.14 CAST IRON PIPES AND FITTINGS

D.12.14.1 The cast iron pipes of LA class shall conform to the 1536 and fittings as per IS 1538 and laying shall be as per IS 3114.

- D.12.14.2 The test procedures, the scale of sampling and the criteria for acceptance of rubber rings shall be as per IS: 5382 and IS: 3400.
- D.12.14.3 The spigot socket joints shall be with lead joints. The lead jointing is done by first caulking in spun yarn and then filling the remainder of the joint space by running in molten lead, taking care that no dross enters the joint, and then thoroughly caulking the lead. The spun yarn shall be used to centre the spigot in the socket and to prevent the flow of molten lead into the bore of the pipe. The spun yarn shall be effectively disinfected before use.
- D.12.14.4 After laying and jointing of CI pipes and fittings the pipelines shall be tested at work site in suitable stretches before backfilling excavated earth, as per clause no. D.1.6 of specification given in Section – D1.
- D.12.14.5 The measurement for CI pipes and fittings shall be as per clause No. D.12.7 of above specification.

D.12.15 CLEANING OF PIPES AND FITTINGS

- D.12.15.1 Contractors shall ascertain that each stretch of pipeline is absolutely clear and without any obstructions by means of visual examination of the interior of pipeline suitably lighted by projected sunlight or otherwise. The open end of an incomplete stretch of pipelines shall be securely closed as may be directed by Client / Engineer to prevent entry of mud or silt etc.
- D.12.15.2 If as a result of the removal of any obstructions Client / Engineer considers that damages may have been caused to the pipeline, he shall be entitled to order the stretches to be tested immediately. Should such test prove unsatisfactory, Contractor shall amend the work and carry out such further tests as are required by Client / Engineer.

D.12.16 PIPE LAYING WORK – GENERAL

- D.12.16.1 Contractor should protect the completed work of pipeline from any damage and prevent the backfilled earth entering into the pipe at his own cost. After laying and jointing of pipeline Contractor should clear the entire pipelines inclusive of manholes / chambers of all debris before testing and commissioning.

D.12.17 REMOVAL OF PLASTER FROM EXISTING WALLS INCLUDING DISPOSAL OF UNSERVICEABLE MATERIALS ETC, COMPLETE WITH ALL LEAD AND LIFT

- D.12.17.1 The existing cement plaster on brick / stone masonry walls shall be removed completely without damaging the existing masonry walls or ceiling. The plaster will be removed to a sufficient depth upto face of existing masonry or ceiling. The masonry wall or ceiling shall be cleaned of all old plaster. The new plaster as specified shall be applied only after the approval of the Engineer.
- D.12.17.2 The payment shall be made on sq. m of the existing plaster removed.

D.12.18 REPLACEMENT OF EXISTING WINDOW SHUTTERS BY PROVIDING AND FIXING 35 MM THICK TEAK WOOD FULLY GLAZED SHUTTERS FOR

WINDOWS INCLUDING BLACK ENAMELED IRON OXIDIZED FIXTURES AND FASTENINGS INCLUDING PRIMER COAT OF APPROVED QUALITY AND TWO COATS OF OIL PAINT ETC. COMPLETE AS DIRECTED

Fully glazed type shutters with 5 mm thick sheet Glasses

(1.1 m x 0.85 m) – 2 Nos.

(0.96 m x 1.2 m) – 2 Nos.

(a) Replacement of existing window shutters:

The existing window shutters shall be carefully taken out and will be stacked as directed. The taking out of existing shutters will be carried out in such a manner that the existing frames will not be teared off and the existing masonry will not be damaged.

(b) Materials :

(i) Teak wood :

The teak wood for shutters shall be of good quality as required for the item to be executed. Good Indian Teak Wood as approved shall be used. The teak wood shall generally be free from large, loose, dead or cluster knots flaws, shakes, and warps, twists, bends or any other defect. It shall generally be uniform in substance and of straight fibres as far as possible. It shall be free from rot, decay harmful fungi and other defects of harmful nature which shall affect the strength, durability of its usefulness for the purpose for which it is required. The colour shall be uniform as far as possible. Any effort like painting, using any adhesive or resin materials made to hide the defects shall render the pieces liable to rejection by the Engineer in charge. All scantalings, planks etc. shall be sawn in straight lines and planes in the direction of grains and of uniform thickness. The tolerances in the dimension shall be allowed at the rate of 1.5 mm per face to be planed.

(ii) Glass :

All glass shall be of the best quality free from specks, bubbles, smokes, veins, air holes, blisters and other defects. The glass shall be sheet glass 5 mm thick. Thickness of glass panes shall be uniform. For panes larger than 600 mm x 600 mm and upto 800 mm x 800 mm, the glass weighing not less than 8.75 Kg./sq.m. shall be used, for bigger panes upto 900 mm x 900 mm glass weighing not less than 11.25 Kg/sq.m. shall be used. Sheet glass shall be patent flattened glass of best quality and for glazing and framing purposes shall conform to I. S. 1761. Sheet glass of specified colours shall be used if so required by Engineer in charge.

(iii) Fixtures and Fastenings

The fixtures and fastenings i.e. butt hinges, tee and strap hinges, tower bolts handles casement window fasteners shall be of black enameled oxidized iron. The item of iron mongery with moving parts shall be properly oiled by the contractor.

(iv) Painting:

(a) Applying priming coat over new wood and based surfaces after and including preparing the surface by thoroughly cleaning of dirt grease, dust

and other foreign matter, sand papering and knotting: Ready mixed paint, brushing wood primer pink.

1.0 Materials:

- 1.1 The ready mixed paint, brushing, wood primer pink shall conform to I. S. 3536-1966.

2.0 Workmanship:

- 2.1.1 All wood work shall be dry and free from any foreign matter incidental to building operations. Nails shall be punched well below the surface to provide a firm key for stopping. Mouldings shall be carefully smoothened with abrasive paper and projecting fibres shall be removed. Flat portion shall be smoothened off with abrasive paper used across the grain prior to painting and with the grain prior to staining or if the wood is to be left in its natural colour, wood work which is to be stained may be smoothened to scraping instead of by glass papering if so required.
- 2.1.2 Any knots, resinous or streaks or bluish sap wood that are not large enough to justify cutting out shellac be treated with two coats of pure shall knotting applied thinly and extended about 25 mm. beyond the actual area requiring treatment.

2.2 Application of primer:

- 2.2.1 After the preparation of the surface, the priming coat shall be applied immediately. The brushing operations are to be adjusted to the spreading capacity advised by the manufacturer of the primer. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing alternatively in opposite directions, two or three turns and then finally brushing lightly in the directions at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying will constitute one coat.
- 2.2.2 During painting, every time after the priming coat has been worked out of the brush bristles or the brush has been unloaded of the bristles of the brush angles to the surface, so that bristles thereafter will collect the correct amount of paint when dipped again into a paint container. The primary coat shall be allowed to dry completely before painting is started.
- 2.2.3 No hair marks from the brush or clogging at paint puddles in the corner or panels angels of mouldings etc. shall be left on the work.
- 2.2.4 Special care shall be taken while painting over bolts, nuts, rivets overlaps etc.

2.2.5 The container when not in use shall be kept close and free from air so that paint does not thicken and also shall be kept guarded from dust.

(b) Painting two coats (excluding priming coat) on new wood and wood based surfaces with of ready mixed paint brushing, oil gloss, semi-gloss, to give an even shade including cleaning all dust, dirt and other foreign matter sand papering and stopping.

1.0 Materials:

The ready mixed paint shall conform as follows

1.1 Oil paints:

Oil paints shall be of the specified colour and shade, and as approved. The ready mixed paints shall only be used. However, if ready mixed paint or specific shade or tint is not available, white ready mixed paint with approved strainer will be allowed. In such a case, the contractor shall ensure that the shade of the paint so allowed shall be uniform.

All the paints shall meet with following general requirements:

1. Paint shall not show excessive setting in a freshly opened full can and shall easily be redispersed with a paddle to a smooth homogeneous state. The paint shall show no curdling, livering, caking or colour separation and shall be free from lumps and skins.
2. The paint as received shall brush easily, possess good leveling properties and show no running or sagging tendencies.
3. The paint shall not skin within 48 hours in a three quarters filled closed container.
4. The paint shall dry to a smooth uniform finish free from roughness, grit, unevenness and other imperfections.

Ready mixed paint shall be used exactly as received from the manufacturers and generally according to their instructions and without any admixtures whatsoever.

The ready mixed paint brushing gloss, semi gloss shall conform to I.S. 129-1962 and I.S. 117-1964.

2.0 Workmanship:

2.1 General

- 2.1.1 The materials required for work of painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums, keg etc. with seal unbroken.
- 2.1.2 All materials not in actual use shall be kept properly protected, lids of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of turpentine to prevent

formation of skin. The materials which have become state or flat due to improper and long storage shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also the paint shall be continuously stirred in smaller container. Bo left over paint shall be put back into stock tins. When not in use, the containers shall be kept properly closed.

2.1.3 If for any seasons, thinning is necessary, the brand of thinner recommended by the manufacturer shall be used.

2.1.4 The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt and grease shall be thoroughly removed before painting is started. No. painting on exterior or other exposed parts of the work shall be carried out in wet, damp or otherwise unfavorable weather and all the surfaces shall be thoroughly dry before painting work is started.

2.2 Application

2.2.1 Brushing operations are to be adjusted to the spreading capacity advised by the manufacturer of particular paint. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.

2.2.2 Each coat except the last cost shall be allowed to dry completely and lightly rubbed with very fine grade of sand-paper and loose particles brushed off before next coat is applied. Each coat shall vary slightly in shade and shall be got approved from Engineer in charge before next coat is started.

2.2.3 Each coat except the last cost shall be lightly rubbed down with sand paper of fine pumie stone and cleaned of dust before the next coat is applied. No hair marks from the brush or clogging of paint puddles in the corners of panels angles of moulding etc. shall be left on the work.

2.2.4 Special care shall be taken while painting over bolts, nuts, rivets, overlaps etc.
Approved best quality brushes shall be used.

3.0 Mode of measurements & payment:

3.1 The rate for shutter includes cost of providing block and clear for keeping the shutter in open position as directed. The dimension of the shutter shall be measured clear size of the shutter in close position between he grooves of the frame.

3.2 The rate shall be unit of one sq.metre.

D.12.19 APPLYING PRIMING COAT OVER STEEL SURFACE INCLUDING PREPARING THE SURFACE BY THOROUGHLY CLEANING, OIL, GREASE, DIRT & OTHER FOREIGN MATTER & SCOURED WITH BRUSHES FINE STEEL WOOD, SCRAPERS & SAND PAPER WITH READY MIXED PRIMING PAINT BRUSHING RED LEAD AND PAINTING SECOND COAT WITH ENAMEL PAINT, BRUSHING TO GIVE AN EVEN SHADE INCLUDING CLEANING THE SURFACE.

Applying priming coat over new / old steel and other metal surfaces after and including preparing the surface by thoroughly cleaning oil, grease, dirt and other foreign matter and secured with brushes, fine steel, wood scrapes and sand paper, with ready mixed priming paint, brushing red lead.

1.0 Materials :

- 1.1 The ready mixed primer, brushing red lead shall conform to I S. 102-1962.
- 1.2 The thinner (linseed oil) shall conform to I. S. 1973. If for any reason, thinning is necessary in case of ready mix paint, the brand of thinner recommended by manufacturer shall be used.

2.0 Workmanship:

2.1 Preparing of surfaces :

The surfaces to be painted shall be cleaned of all rust, scale, dirt and other foreign matter sticking to it with wire brushes, steel wool, scrapers, sand paper etc. This surface shall then be wiped finally with mineral turpentine which shall also removed grease and perspiration of hand marks. The surface shall then be allowed to dry.

2.2 Application of primer :

- 2.2.1 After the preparation of the surface, the priming coat shall be applied immediately. The brushing operations are to be adjusted to the spreading capacity advised by the manufacturer of the particular primer. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing alternately in opposite directions, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.
- 2.2.2 During painting, every time after the priming coat has been worked out of the brush bristles or after the brush has been unloaded of the bristles of the brush shall be opened up by striking the brush against portion of the unpainted surface with the end of the bristles, held at right angles to the surface, so that bristles thereafter will collect the correct amount of paint when dipped again into a paint container. The primary coat shall be allowed to dry completely before painting is started.

2.2.3 No hair marks from the brush or clogging at paint puddles in the corner or panels angles of mouldings etc. shall be left on the work.

2.2.4 Special care shall be taken while painting over bolts nuts, rivets overlaps etc.

2.2.5 The container when not in use shall be kept close and free from air so that paint does not thickness and also shall be kept guarded from dust.

3.0 Painting one coat (excluding priming coat) on previously painted steel and other metal surface with enamel paint, brushing to given and even shade including cleaning the surface of all dirt, dust and other foreign matter.

3.1 Materials & Workmanship:

3.1.1 The relevant specifications of item no. above shall be followed except that painting shall be carried out in one coat with enamel paint on previously painted steel and metal surface.

4.0 Mode of measurements & payment:

4.1 The new steel and other metal surface shall be measured under this item.

4.2 All the work shall be measured net in the decimal system as executed subject to the following limits unless otherwise stated hereinafter :

(a) Dimensions shall be measured to the nearest 0.01 metre.

(b) Areas shall be worked out to the nearest 0.01 sq.metre.

4.3 No deductions shall be made for openings not exceeding 0.5 sq.mt. Each and no addition shall be made for painting to beadings, mouldings, edges, jambs, soffits, etc. of such opening.

4.4 In case of fabricated structural steel and iron work, priming coat of paint shall be included with fabrication. In case of trusses if measured in sq.m. Compound girders, stanchions, lattices, girder and similar work, actual area shall be measured in sq.m. and no extra shall be paid for painting on bolts, heads, nuts, washers etc. No addition shall be made to the weight calculated for the purpose of measurements of steel and iron works for paint applied on shop or at site.

4.5 The different surfaces shall be grouped into one general item, areas of uneven surface being converted into equivalent plain areas in accordance with the standard practice.

4.6 The rate shall be for a unit of one sq.metre.

D.12.20

REPAIRING CRACKS INCLUDING CHIPPING OF THE PLASTER IN THE CRACKED REGION, CLEAN THE SURFACE, FILL UP THE CRACK WITH NON-SHRINK GROUT FIXING G. I. WELD MESH ON EXPOSED SURFACE, APPLY 15 MM THICK LAYER OF CEMENT MORTAR WITH GRIT AND POLYMER, AFTER SETTING THE FIRST LAYER, APPLY SECOND COAT

OF PLASTER WITH 1:3 CEMENT MORTAR ENTIRE TO THE SATISFACTION OF ENGINEER IN CHARGE.

The existing cracks will be cut to V-section and scrapping of plaster on either side in width about 3 cms will be carried out. The cracks will be thoroughly cleaned and wetted. The cracks will then be filled with non shrink grout like epoxy grout in ratio of 1: 0.8 (1 part of resin using + 0.8 part of hardener). The mix epoxy grout is to be injected by means of pressure pumps at 4 KG/cm² pressure into the cracks. Instead of epoxy grouting of cracks, polymer grouting i.e. 1 part cement: 1 part polymer (by weight) and inject the slurry by pressure pump as above. The slurry will penetrate in fine cracks.

Sealing of cracks will then be carried out after the pressure grouting by means of polymer mortar (Cement + polymer additives) i.e. 1 part cement: 3 parts of sand with polymer 1 part (by weight).

The parts so prepared will be applied in 15 mm thick as polymer mortar. After setting of this polymer mortar, the second coat of ordinary cement plaster in C.M. 1:3 of required thickness or as directed by Engineer in charge shall be applied.

Before applying polymer mortar G.I. welded mesh on the exposed surface shall be fixed.

The rate quoted by the contractor for this item includes crack filling by epoxy or polymer grouting as per specifications, sealing of the cracks by polymer mortar with G. I. Welded mess, finishing with neat cement slurry with existing surface with colour as per site condition, labour, materials, machinery, equipment, scaffolding, curing, cleaning etc. complete and will be paid on running meter basis for such work carried out.

D-13: ROAD CUTTING, ROAD REINSTATEMENT AND CONNECTION WITH EXISTING TRUNKS

SECTION: D-13

D.13.1.1 General

D.13.1.1.1 This part of the specification deals with the general requirements for cutting the existing asphalt / cement concrete / WBM / murrum / earth surfaces of any thickness of roads crossing the water supply pipeline. The scope also includes the reinstatement of asphalt / cement concrete / WBM / murrum / earth surfaces of design thickness crossing the water supply pipeline. This specification also covers the cutting of existing water supply line, pumping out water from it by suitable means, working in wet conditions.

D.13.1.2 Cutting of asphalt, WBM, murrum and earth surfaces

D.13.1.2.1 The existing asphalt, WBM, murrum and earth surfaces of the roads crossing the proposed water supply pipeline will be cut only for necessary width, length. The surfaces will be cut of any thickness. The measurement will be paid on square meter basis.

D.13.1.3 Reinstatement

D.13.1.3.1 Reinstatement of asphalt pavement using same material for soling and providing new soling if required and new metalling grouting with tack coat etc. completed as directed.

The excavated asphalt pavement shall be reinstated using the same material for soling obtained from excavation and providing new soling if required and new metalling and grouting with tack coat etc. The thickness of the soling and metalling shall be carried out as directed. The metalling surface shall be grouted with tack coat of asphalt as instructed by Engineer-in-charge.

D.13.1.4 The payment for cutting of asphalt surfaces of any thickness and reinstatement of asphalt road payment will be made on sq.mt. basis of the work carried out.

D.13.1.5 Connection with Existing Trunks

D.13.1.5.1 It will be necessary to give connections of the new water supply lines to the existing trunk mains to the ends of the pipelines laid. This will include the cutting of the shell, pumping out water, working in wet conditions, working at a instructed specific time of day or night etc. complete. The item includes labour charges for cutting existing CI pipes for making branch connection and fixing CITEE, collar all other specials required to complete the connection and it includes necessary excavation in all sorts of soil, dewatering trenches, lowering the installation with all jointing material like lead etc. make joint leak proof taking all precaution, deploying signals, reflect lights etc. complete and the payment will be made per kg. of specials and fittings connected. The specials and fitting required for connection will be supplied by AMC.

D-14 : ENCASING

SECTION : D-14

- D.14.1** **Providing C.C M:15 for encasing of M.S. pipes using trap metal size 40mm to 50mm including form work, curing, consolidation etc. complete as per specifications and as per drawings at various chainages of the alignment as per decision of engineer in charge.**

The specification for material i.e. cement, sand and coarse aggregate shall be as per general specification of material given in this tender.

The proportion of concrete shall be **M:15** by volume. Size of coarse aggregate shall be graded from, 6 mm to 20 mm size black trap metal.

D.14.2 **MIXING:**

Concrete shall be mixed in a mechanical mixer at the site of work. Care shall be taken to the mixer and the other accessories are in first class working conditions and maintained so through out the construction, mixing shall be continued until there is a uniform distribution from the materials and a uniform colour of the mix is obtained and each individual partial of coarse aggregate cement but in no case, the mixing shall be done for the less than two minutes.

When hand mixing is permitted but the engineer in charge, it shall be carried out on a smooth water tight platform large enough to allow efficient turning over of the ingredients of concrete before and after adding water. Care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. Mixing platform shall be so arranged that no foreign materials shall get mixed with concrete not the mixing water shall flow out.

The cement is required quantity shall be spread in uniform layer on top of the measured quantity of fine aggregate required, also spread in a layer of uniform depth of mixing platform, Dry fine aggregate (sand) and cement shall then be mixed thoroughly by turn over to form a mixture of uniform colour. Enough water shall then be added gradually and the mass turned over till a mortar of required consistency obtained. The measured quantity of coarse aggregate shall then be placed on the mixing platform and wetted and the prepared mortar added and the entire mass turned and prevent loss of liquid for concrete and sufficiently strong to turn until all the particles of coarse aggregate are fully coated with mortar and mixer is of uniform colour and required consistency. In hand mixing quantity of cement shall be increased by 10% above the specified quantity without any extra cost.

D.14.3 **FORM WORK:**

Form work shall be of approved quality. All form work shall be rigid, of suitable dimensions. All form perfect by closed so as to withstand the weight of concrete without bulking or distortion. No form work shall be removed after concrete shall be handled from the place of mixing to the place of final deposit as rapidly as practicable

by methods which will prevent the segregation does occur during transport the concrete shall be remixed before being placed.

D.14.4 PLACING AND COMPACTING:

D.14.4.1 GENERAL :

The concrete shall be placed in to its final position compacted and finished within 30 minutes of mixing the water and the before setting commences and should not be subsequently disturbed. The method of placing shall be such as to avoid segregation. The placing of concrete shall be done in balanced manner to avoid eccentric loads on, form work. The concrete shall be deposited in continuous horizontal layers in thickness not exceeding 3 cm depending upon the size and the nature of work and as directed by the Engineer-in-charge. No more than one hour shall elapse between the placing of the successive layers in any portion in a continuous pour of concrete.

Special case shall be taken in filling each part of the forms by depositing concrete directly as near the final position as possible concrete shall not be dropped from a height of more than one meter.

D.14.5 CURING :

The concrete shall be initially protected from damage on a account of impact, undue pressure, excessive heat of run, rain etc. and covered with wet sacking, canvassing during initial set. After set the concrete shall be kept wet not less than for seven days form the date of placing of concrete during the initial stage. On Sundays, holidays and days of cessation of work, arrangement shall be made to keep the concrete continuously watered, continuously the contractor shall provide labour materials and equipments required for watering and recover the cost form the contractor.

D.14.6 Thrust Block/ Anchor block :

D.14.6.1 Scope:

Designing and constructing/Providing R.C.C.(1:2:4) for thrust blocks supports / pedestals / Anchor block at various chainages of varying sizes and shapes using trap metal of 20 mm nominal size including form work, curing, consolidating etc. complete including required M.S. reinforcement as per design approved by engineer in-charge including all taxes, insurance etc. complete

D.14.6.2 Design:

Bidders shall take into account the change in alignment of the pipeline in both horizontal and vertical direction, along the entire route of pipeline. Pipe bends to suite the change in alignment are to be provided. Detail design for each bend having equal to or more than 10 degree, shall be design according to the working pressure at such bends. Size of such anchor blocks/thrust blocks shall be provided as per the approved design.

D.14.7 Construction :

Thrust blocks / Anchor shall be constructed in RCC M 15 (1:2:4) in accordance with all technical specification of Excavation, Concrete work, Centering works, Reinforcement work and workmanship as per the standard technical specifications.

**D-15 : LOWERING, LAYING, JOINTING DI PIPES, SUPPLYING
DI / CI SPECIALS AND FITTINGS, SUPPLYING
LOWERING, LAYING & FIXING DI (SG IRON)
BUTTERFLY VALVES, SLUICE VALVES,
AIR VALVES AND SCOUR VALVES AND CONSTRUCTION
OF VALVE CHAMBERS**

SECTION : D-15

D.15.1 SCOPE :

Carting the DI (SG IRON) / CI pipes from AMC store or from the place as directed by AMC. Lowering, laying and jointing by tyton or lead joints DI (SG IRON) / CI pipes of various diameters supplied by AMC including Hydro testing of pipes, excavation of trenches for pipeline refilling the trenches and carting the extra stuff with 100 m. lead etc. complete.

D.15.2 APPLICABLE CODES :

The lowering, laying, jointing and testing at work sites of ductile iron (SG IRON) pipes and cast iron pipes and DI / CI specials and fitting will comply with all currently applicable statutes, regulations, standards and codes. In particular, the following standards, unless otherwise specified herein, will be referred. In all cases, the latest revision of the codes will be referred to. If requirements of this specification conflict with the requirements of the codes standards, this specification will govern.

	IS No.	Title
(a)	638 – 1979	: Sheet rubber jointing and rubber insertion jointing (second revision)
(b)	5382 – 1985	: Rubber sealing ring for gas mains, water mains and sewers (first revision)
(c)	6452 – 1989	: Specification for high alumina cement for structural use
(d)	6909 – 1990	: Specification for super sulphated cement
(e)	8112 – 1989	: 43 grade ordinary Portland Cement (first revision)
(f)	9523 – 1980	: Ductile iron fittings for pressure pipes for water, gas and sewage
(g)	12330 – 1988	: Sulphate resisting Portland Cement

Following IS code will be applicable for :

The rubber gaskets will conform to IS : 5382 – 1969 or its latest addition.

The following IS codes will be applicable for Cast Iron Pipes.

- | | | | |
|----|-----------|---|-----------------------------------|
| a) | IS : 782 | : | Specification for caulking lead |
| b) | IS : 6587 | : | Specification for spun hemp yarn. |

Code Of Practice

- | | | | |
|----|-----------|---|---|
| a) | IS : 3114 | : | Code of practice for laying of cast iron pipes. |
|----|-----------|---|---|

D.15.3 EXCAVATION FOR PIPE LINE TRENCHES

Excavation for pipe line trenches in all strata (including hard rock) including all safety provisions using site rails and stacking excavated stuff up to a lead of 100 mts., cleaning the site incl. jungle cutting etc. The earth cover over the top of the pipe should be 1.3 meter. The width of trench should be 30 cm on each side of the pipe. The rate includes cost of extra excavation for working space at joint, dewatering, blasting etc.

D.15.3.1 General

The excavation for trenches will generally, refer to open excavation for trenches in wet / dry conditions for pipe laying work.

D.15.3.2 Clearing Of Sites:

The site on which the pipelines are to be laid and shown on plan and the area required for setting out and other operations will be cleared and all obstruction loose stones and materials, rubbish of all kinds, stumps, brushwood as trees will be removed as directed the roots will be entirely grubbed up.

The products of the clearing to restocked in such a place and in such a manner, as directed by the engineer in charge.

In jungle clearings, all trees not specially marked for preservation, bamboo's jungle wood and brushwood will be cut down their roots grubbed up. All wood and materials from the clearing will be the property of the Board will be arranged as directed by the Board Engineer or his authorized agent, the material pronounced as useful by the Engineer will be conveyed and properly stacked as directed within the specified limit. Unless materials will be burnt or otherwise disposed off as directed.

All holes or hollows whether originally existing or produced by digging up roots, will be carefully filled up with earth, well earth, well rammed leveled off, as may be directed.

D.15.3.3 Setting Out:

The center lines of all pipe trenches etc. will be given by the Engineer-in-charge and it will be the responsibility of the contractor to install substantial reference marks, bench marks, etc. and maintain them as long as required true to line, level curve and slopes. The contractor will assure full responsibility for alignment, and dimension of trench.

The labor materials etc. required for setting out and establishing benchmarks and other reference marks will be arranged by the contractor at his own cost.

D.15.3.4 Excavation

The excavation incl. Bailing out of water for the pipe trenches will also incl. Removal of all materials of whatever nature and whether wet or dry condition necessary for laying of pipelines exactly in accordance with alignment, levels grades and curves shown on the plans or as directed by the Engineer-in-charge. Trenches will be excavated to the exact width and depth according to the size of pipe and the sides will

be left vertical as far as possible or according to the angle of repose various soils. Unless there is a specific extra provision in the contract for shoring and strutting or for cutting side slopes the contractor will at his own cost do the necessary shoring and strutting or cutting of slopes to a safe of repose or both approved by the Engineer-in-charge. The contractor will notify the Engineer before starting excavation to enable him to take cross sectional levels for purpose of measurements before the ground is disturbed. The bottom of the trenches will be leveled both longitudinally and transversely or slopped as directed by the Engineer. The contractor will at his own cost to remove such portions of boulders or rocks, as are rectified to make the bottom of the trench level. No filling will be allowed to bring the trench to level. If by contractor's mistake excavation is made deeper than shown on the plans and if ordered by the Engineer the extra depth will have to be made with selected excavated stuff only with watering, remedying etc. as directed, by the Engineer and at the cost of the contractor. Other hard excavation will be cleared of all sorts and loose materials and cut to firm surface, either level, stepped as directed by the Engineer. The Engineer may order such changes in the dimensions and alignment of pipe trench as may be deemed necessary to secure satisfactory cover over pipeline. The contractor will, at his own expense, make provision for bailing out of draining water and the trenches will be kept free of water, during laying work.

After each excavation is completed, the contractor will notify the Engineer to that effect and no laying of pipeline will be allowed to laid until Engineer has approved the depth and dimensions of trenches level and measurements.

D.15.3.5 Shoring and Strutting:

Shoring & strutting and dewatering if required will have to be carried out by the contractor, for which any extra charge will not be paid

During excavation if water connections, sewage connections, telephone lines khalkuva (soak pits) etc. are damaged by the contractor, the same will have to be restored by the contractor without any extra payment.

D.15.3.6 Protection

The trenches will be strongly fenced and red light signal will be kept at night and arrangement of watchman to prevent accidents should be done, sufficient care protective measure will be taken to see that the excavation will not affect or damage the adjoining structure. The contractor will be entirely responsible for any injury to life and damage to the properties etc. Necessary protection work such as guide ropes, crossing places, barricades, caution boards etc. will be provided by the contractor.

The excavation in all sort of soil, hard muran, soft rock or hard rock or any type of soil will have to be carried out up to the required depth by the agency

D.15.3.7 Disposal Of Excavated Stuff

No excavated stuff from trench are to be placed even temporarily nearer than 1.5 meter or greater distance up to 90 meter or as prescribed by the Engineer from the outer edge of trench. All excavated material will be the property of the Corporation. The rate of excavated includes sorting out of useful materials and stacking then separately as directed within specified lead. The excavated stuff suitable and useful for refilling or for other use will be stacked at convenient places. The materials not useful in any wet will be disposal off as directed by the Engineer from the outer edge of trench.

The site should be cleared off on completion of work.

D.15.3.8 Transportation of surplus material

- a) For 0 to 5 Km.
- b) For 5 Km. to 10 Km.

The general technical specification as laid down under section D-1, Earth work in trenches, excavation and back filling will also apply to this.

After refilling the trenches, with approved material, the surplus and rejected material shall be removed forth with from the site and will be transported to a location as approved by Engineer in charge. The same shall be deposited / disposed off as directed by Engineer in charge. The payment will be made on cum basis and as per lead of material to where transported. The payment will be made on the rates quoted by the contractor the item upto 5 Km. and from 5 to 10 Km. lead. The rate also includes loading, unloading dressing of the material.

D.15.3.9 Additional Requirements

At the joints of pipes, the trench will be excavated to an additional depth of 15 cm. and width of 30 cm. And length of 15 cm. beyond the edge of collar on both the sides or as directed. The rate include for such extra excavation made at the joints. The trenches will be excavated perfectly in straight line. The bottom of the trench will be kept as per invert level or as directed. To maintain the proper slop the usual method of site rails and boning rods will be adopted. The contractor will have to provide and fix and maintain sight rails and boning rod without any extra cost.

If the contractor fails or makes delay to give hydraulic test of the pipe line laid in any of the section, without any genuine reason, he will be responsible to get any part of the length trenches refill in such case i.e. before tasting for safety of pedestrian and/or vehicular traffic as found necessary by the engineer-in-charge without any extra cost. If found necessary any directed by the Engineer-in-charge. The contractor will have to excavated the refilled trenches, during hydraulic test without any extra cost.

At all road crossings, trenches will be excavated only for half width of the road and pipe will be laid. The other half will be excavated only after back filling over the laid pipeline is done so as to make it suitable for the traffic. The contractor will provide direction when the pipe line is to be laid along the road as required and will maintain the diversion or any part of it, without any extra cost. At all road crossings, the pipe will be laid below the crest of read.

The contractor will break the road surface by excavation chiseling to the exact width and length as shown on the drawing or as directed by the Engineer-in-charge.

The excavated stuff will be deposited in uniform layers to avoid mixing with other kind of materials at non-objectionable place or as directed by the Engineer-in-charge.

D.15.3.10 The item of excavation will include unless and otherwise mentioned.

- (a) Clearing of site

- (b) Setting out work including all materials and labor.
- (c) Providing and subsequently removing, shoring and strutting ort outing slopes etc.
- (d) Excavation and removal and staking of all excavated stuff as directed.
- (e) Necessary protection including labour materials equipment etc. to ensure safety and protection against risk or accident.
- (f) Providing facilities for inspection and damage to property if caused during progress of work.
- (g) Compensation for injury to life and damage to property if caused during progress of work.
- (h) Restoring of water supply connections, sewer connections, telephone lines, khalkuva soapiest etc. if damaged by contractor without extra Payment.
- (i) Dewatering of excavated pit trench during the progress of work.
- (j) Clearing the site on completion of works directed by the Engineer.

D.15.4 TRANSPORTING OF PIPES, SPECIALS ETC.

- D.15.4.1 All pipes stacked in the AMC's stores will be transported to the site of laying after cleaning them internally etc. **The loading in the stores will be carried out by means of either a crane, gantry or shear legs, so as not to cause any damage to the finished material. Similarly, while unloading and stacking, great care will be taken to ensure that the material is not damaged or dented.** The contrivances to be used for unloading will be different in different situations and in each case the one approved by the Engineer will be adopted. **The material stacked at site will be jointly inspected by the Engineer and the Contractor and defect or damage noticed will be repaired to the satisfaction of the Engineer before payment is admitted.**
- D.15.4.2 **Props of approved designs for maintaining circularity having wooden planks at both ends to avoid metal to metal contact will be fixed to the pipes during transit to avoid undue sagging and consequent distortion. After the pipes are carefully stacked, props should be retained till pipes are joined in trenches and then props are re-used for subsequent similar operations.** The stacking ground, at the site of laying will be selected in such a way as not to get waterlogged during monsoon. If this cannot be done, **the pipes will be supported on sleepers to avoid contact with wet earth and subsequent rusting. In order to prevent sagging during transit, savings of steel plates** can be utilized by cutting to the required length and tacking the same to the **pipe ends**, in place of props, if approved by the Engineer.
- D.15.4.3 As explained in earlier paragraphs, materials such as pipes, tapers, etc. may be transported to the site of laying as soon as the material is finished in all respects with the permission of the Engineer to avoid congestion in the Contractor's yard. However, materials such as expansion joints, composite bends, 'T' branches and other complicated materials will be stacked in the Contractor's yard until they are required for laying in the field. In view of this, the work of fabrication of such materials will be properly synchronised as far as possible with the laying operations.
- D.15.4.4 Fabricated materials such as specials, appurtenances, bolts, nuts, distance pipes, flanges, saddles, collars bypass arrangements etc. will be transported to the site of laying from the fabrication shop according to the needs of the laying operations only. In regards access roads, the Contractor will note that access road may lead upto some points on the

alignment the Contractor will have to make his own arrangement for connecting approaches to transport the pipes cross country to the actual site of laying at his own cost. Whatever may be the mode of transport he uses it will be incumbent on the Contractor to carry and stack the pipes and specials along the alignment as close as possible to the site of laying.

D.15.5 PROCEDURE FOR RECEIVING STEEL PIPES

D.15.5.1 General

To ensure that the work of erecting pipes is not held up at any stage and place, the Contractor will maintain an adequate stock of standard specials, flange rings, plug plates, manhole covers, etc. and short length of smaller diameter pipelines, etc. at site in his field stores, in consultation with the Engineer.

D.15.5.2 Stacking of pipes, etc. and inspection

The Contractor will keep in each section a responsible representative to take delivery of the pipes, specials and appurtenances, etc. transported from the fabricating stockyard or received from any other work site to the site of laying and to stack along the route on timber skids. Padding will be provided between coated pipes and timber skids to avoid damage to the coating. Suitable gaps in the pipes stacked will be left at intervals to permit access from one side to the other. The pipes, specials, appurtenances so received on site will be jointly inspected and defects recorded, if any, such as protrusions, grooves, dents, notches, damage to the internal coating etc. will be pointed out immediately to the Engineer at the site and in the acknowledgement challans. Such defects will be rectified or repaired to the satisfaction of the Engineer entirely at the Contractor's risk and cost.

D.15.5.3 Handling of Pipes, special appurtenances etc.

It is essential to avoid damage to the pipes, fittings and specials, etc. or their coatings at all stages during handling. The pipes and specials will be handled in such a manner as not to distort their circularity or cause any damage to their surface treatment. Pipes will not be thrown down from the trucks nor will they be dragged or rolled along hard surfaces. Slings of canvas or equally non-abrasive materials of suitable width of special attachment shaped to fit the pipe ends will be used to lift and lower coated pipes to prevent damage to the coating.

Great care will be taken in handling the pipe right from the first operation of manufacture until they are laid and jointed. The Contractor will provide temporary props as described earlier in order to prevent any sagging of the pipes while they are stacked in their yard and while transporting to the site of delivery, i.e. laying. The props will be retained until the pipes are laid and welded. If at any time these props are found to be dislodged or disturbed, the Contractor will immediately reinstate them in such a way that the true shape of the pipe shell or specials is maintained to the satisfaction of the Engineer. No defective or damaged pipe or special will be allowed to be used in the work without rectification to the satisfaction of the Engineer. Any damage to the coating will be repaired by the Contractor at his own cost to the satisfaction of the Engineer.

D.15.5.4 Dents

Whenever any dent, i.e. a significant alteration of the curvature of the pipe shell is noticed, the depth of the dent will be measured between the lowest point of the dent and the pipe shell curvature line. All dents exceeding 2 percent of the outer diameter of the pipe will be removed by cutting out a cylindrical portion of the pipe and replacing the same by an undamaged piece of the pipe. The Engineer may permit insert patching if the diameter of the patch is less than 25 percent of the nominal diameter of the pipe. Repairs by hammering with or without heating will not be permitted. Any damage to the coating will also be carefully examined and rectified.

D.15.5.5 Marking

The component parts of the pipes / specials / fittings will be carefully marked for identification in the field. The marking will be on the side which will be the inside of the pipe after bending.

The marking operation will be conducted with full size rulers and templates. Only blunt nose punches should be used.

The plates used for fabrication of pipes / Specials will be laid out in such a way that when the shells are completed one set of original identification markings for the material will be plainly visible. In case these markings are unavoidably cut out, they will be accurately transferred by the Contractor to a location where these markings will be visible on the completed work.

D.15.6 LAYING OF PIPELINE

D.15.6.1 General

Unless specified otherwise, the pipeline will be buried with minimum cover at top, 1.30 mt. No material will be erected unless it has been previously passed by the Engineer.

D.15.6.2 Lowering and Jointing

The pipe will be lowered into the trenches by removing only one or two struts at a time. It will be seen that no part of the shoring is disturbed or damaged and, if necessary, additional temporary struts may be fixed during the lowering operations. It will also be necessary to see that the outside painting of pipe is not damaged in anyway during the lowering and assembling. After the pipe is lowered into the trench, it will be laid in correct line and level by using the levelling instruments, sight rails, theodolite, etc. Care will be taken to see that the longitudinal joints of two consecutive pipes at each circumferential joints are staggered by 90°. While assembling the pipes, the ends will have to be brought close enough to leave a uniform gap not exceeding 4mm.

D.15.6.3 Precautions against Floatation

When the pipeline laid underground or above ground in a long narrow cutting gets submerged in water collected in the trench of cutting it is subjected to an uplift pressure due to buoyancy and is likely to float if completely or partly empty. **In the design of pipelines, provision is to be made to safeguard against floatation providing sufficient overburden or by providing sufficient dead weight by means of blocks, etc. Factor of safety for calculations for check against floating will be taken as 1.2.**

In the case of works extending over one or more monsoon seasons, however, special care and precautions are necessary during the progress of work on this account. The Contractor will close down pipe laying operations well in time for the monsoon. The work of providing blocks, refilling the earth to the required level, compacting the same, etc. will always be done as soon as the pipeline in the cutting has been laid.

The Contractor will see that the water will not be allowed to accumulate in open trenches. Where work is in an incomplete stage, precautionary work, such as blank-flanging in the open ends of the pipeline and filling the pipeline with water etc. will be taken up as directed by the Engineer.

Such works will be to the Contractor's account and no separate payment will be made for the same. The Contractor's rate for pipe laying will be deemed to include such precautionary measures against floatation.

Protection of the pipeline against floatation during the Contract Period will be the responsibility of the Contractor. Should any section of the pipeline float due to his negligence, etc. the entire cost of laying it again to the correct line and level will be to his account.

D.15.6.4 Refilling of trenches

On completion of the pipe laying operations in any section, for a length of about 100m and while further work is still in progress, refilling of trenches will be started by the Contractor with a view of restricting the length of open trenches. **Pipe laying will closely follow the progress of Trench Excavation and the Contractor will not permit unreasonably excessive lengths of trench excavation to remain open while awaiting testing of the pipeline (for field testing of pipeline as mentioned in this document).** If the Engineer considers that the Contractor is not complying with any of the foregoing requirements, **he may prohibit further trench excavation until he is satisfied with the progress of laying and testing of pipes and refilling of trenches. Filling will be done in layers not exceeding 150mm and compacted to 70 to 80% of max. dry density percent of the maximum dry density as per part VII of IS:2720.** The excavated material nearest to the trench will be used first. **Care will be taken during backfilling, not to injure or disturb the pipes, joints or coating. Filling will be carried out simultaneously on both sides of the pipes so that unequal pressure does not occur.** Walking or working on the completed pipeline unless the trench has been filled to height of atleast 30cm over the top of the pipe except as may be necessary for tamping etc., during backfilling work.

The remaining portion of the trench may be filled in with a mixture of hard and soft material free from boulders and clods of earth larger than 150mm in size if sufficient quantity of good earth and murrum are not available. **Filling in will be done in layers not exceeding 225mm in thickness accompanied by adequate, ramming etc., so as to be compacted to 70 to 80% of the maximum dry density as per part VII of IS:2720. Water contents of the soil will be as near the optimum moisture content as possible. The trench will be refilled so as to build up to the original ground level, keeping due allowance for subsequent settlement likely to take place.**

The Engineer will, at all times, have powers to decide which portion of the excavated materials will be for filling and in which portion of the site and in what manner it will be so used.

If any material remains as surplus it will be disposed of as directed by the Engineer, which includes loading, unloading, transporting and spreading as directed within a distance of as mentioned in the item. The labour contractor will be paid for this extra work as per his rates quoted in the tender.

If suitable material for refilling is not available for excavation the Contractor will bring earth, murrum of approved quality as directed by the Engineer.

D.15.6.5 Field Hydraulic Test

All the pipes shall be tested hydrostatically at a pressure specified in Table No. 1 of IS:8329 – 2000.

D.15.6.6 Test Certificates

- e. The contractor shall always provide manufacturers test certificate for the grade of material and yield strength in accordance with every batch/lot of goods as manufactured and supplied.
- f. The contractor shall also produce in addition to manufacturer's test certificate as mentioned above test certificate from person / agency appointed by AMC for third party inspection. Inspection charges will be paid by contractor.
- g. If the test reports of pipe are not satisfactory, the entire lot will be rejected.
- h. Each pipe and special shall be inspected and tested in factory and a special register of pipe testing shall be maintained and a copy of the same shall be submitted alongwith the delivery of pipes and specials every time.

AMC will assist the contractor in identifying the source & in obtaining permission for drawal of water for field-testing of pipe. The contractor shall pay for the water and carry the water to the test location at his cost. The cost of hydraulic testing of the installation by providing necessary testing equipment, pumping the water, creating and maintaining pressure, and the necessary bulk heads and their fixtures, and their subsequent removal and restoring the installation to working trim shall be included in the rate for laying and testing of the pipe.

D.15.7 CLEANING, DISINFECTIONING AND COMMISSIONING OF THE PIPELINE

Upon completion of a newly laid main, the main will be disinfected as directed by the Engineer.

The main will be flushed prior to disinfection except when the tablet method is used. After initial flushing, the hypochlorite solution will be applied to the water main with mechanically or electrically powered chemical feed pump designed for feeding chlorine solutions. For small applications, the solution may be fed with a hand pump.

In the case of main of large diameter, water from the existing distribution system or other approved source of supply will be made to flow at a constant measured rate into the newly laid pipe line. The water will receive a dose of chlorine also fed at a constant measured rate. The two rates will be proportioned so that the concentration in the water

entering the pipeline is maintained at no less than 300 mg/l. The chlorine will be applied continuously and for a sufficient period to develop a solid column of 'Slug' of chlorinated water that will as it passes along the line expose all interior surfaces to a concentration of at least 300 mg/l. for atleast 3 hours. As the chlorinated water flows past tees and crosses related valves and hydrants will be operated so as to disinfect the appurtenances.

In the case of newly laid mains in which scrupulous cleanliness has been exercised the tablet method can be adopted and in this method, the initial flushing is dispensed with. The calcium hypochlorite tablets are placed in each section of pipe and also in hydrants, hydrant branches and other appurtenances. The tablets will be attached by an adhesive and must be at the top of the main. The main will then be filled with water and the water will remain in the pipe for atleast 24 hours.

After the applicable retention period, the heavily chlorinated water will be flushed from the main until the chlorine concentration in the water leaving the mains is not higher than that generally prevailing in the system or less than 1 mg/l.

After final flushing and before the water main is placed in service, a sample or samples of water will be collected from the end of the line and tested for bacteriological quality and will show the absence of coliform organisms. If the initial disinfections fails to produce satisfactory samples, disinfections will be repeated until satisfactory, samples are obtained before the main is placed in service.

The Contractor is expected to carry out the disinfections work as a part of laying the pipes and his rates for laying the pipes should include the disinfections and other connected works till the main is placed in service, unless otherwise specified in the schedule.

Measurement and Payment :

The rate of the item includes lowering, laying and jointing DI/ CI pipe with tyton / lead joint including excavation, refilling the trenches and carting extra stuff with 50 mt. lead with all labour and materials required for jointing the pipes and will be paid per meter of the pipeline laid and jointed. The rate for specials and fittings includes lowering, laying and jointing all types of fittings including excavation refilling the trenches and carting extra stuff with 50 . mt. lead with all labour and materials required for jointing the specials and fittings and will be paid per number of such specials / fittings laid and jointed.

D.15.8 CAST IRON FITTINGS:

D.15.8.1 scope :

This specification covers the general requirements for cast iron fittings for pressure pipes for water, gas and sewage.

This specification is applicable to all cast iron fittings having spigots, sockets or flanges as specified in this standard and also to fittings with other type of joints, the general dimensions of which, except those relating to the joints, conform to this standard.

D.15.8.2 References :

The following Indian Standard are necessary supplementary to this standard. In all cases, the latest revision of the codes shall be referred to :

IS No.	Title
210 : 1978	Grey iron castings (third revision)
290 :	Specification for coal tar black paint
638	Specification for sheet rubber jointing & rubber insertion jointing
782	Specification for caulking lead
1387 : 1993	General requirements for the supply of metallurgical materials (second revision)
1500 : 1983	Method for Brinell hardness test for metallic materials (second revision)
1536	Specification for centrifugal cast (Spun) iron pressure pipes for water, gas & sewage
1537	Specification for vertically cast iron pressure pipes for water, gas & sewage
1538	Specification for cast iron fittings for pressure pipes for water, gas & sewage
2078 : 1979	Method for tensile testing of grey cast iron
6587 :	Specification for span hemp yarn
11606 : 1986	Method of sampling of cast iron pipes and fittings

D.15.8.3 Supply Of Material :

The general requirements relating to the supply of the material shall be as laid down in IS 1387 : 1993.

D.15.8.4 Manufacture

The metal used for the manufacture of pipes shall be of a quality not less than that specified for Grade FG 150 of IS 210 : 1978.

The fittings shall be stripped with all the precautions necessary to avoid warping or shrinking defects. The fittings shall be free from defects, other than any unavoidable surface imperfections which result from the method of manufacture and which do not affect the use of the fittings. By agreement between the manufacturer and the purchaser, minor defects may be rectified.

The fittings shall be such that they could be cut, drilled or machined and may be accepted provided the hardness of the external unmachined surface does not exceed 210 HBS.

In the case of spigot and socket ends suitable for lead joints, the socket shall be with or without the centering ring.

In the case of flanged joints, the flanges shall be at right angles to the axis of the joint and machined in face. The bolt holes shall be drilled.

The bolt hole circle shall be concentric with the bore and bolt holes shall be located off the centre lines, unless otherwise specified by the purchaser. The two flanges of the fittings shall be correctly aligned.

D.15.8.4.1 General

D.15.8.4.2 C. I. Pipes and fittings shall be systematically checked for any manufacturing defects by experienced supervisor and a very high standard of quality shall be maintained.

D.15.8.4.3 Owner/Engineer shall at all reasonable times have free access to the place where the pipes and fittings are manufactured for the purpose of examining and testing the pipes and fittings and for witnessing the test and manufacturing.

D.15.8.4.4 All tests specified either in this specification or in the relevant Indian Standard shall be performed by the supplier / contractor at his own cost and in presence of Owner / Engineer if desired. For his, sufficient notice before testing of the pipes and fittings shall be given to Owner/Engineer.

D.15.8.4.5 If the test is found unsatisfactory, Owner/Engineer may reject any or all pipes and fittings of that lot. The decision of Owner / Engineer in his matter shall be final and binding of the contractor and not subject to any arbitration or appeal.

D.15.8.4.5 Mechanical Tests

Mechanical tests shall be carried out during manufacture. Two sets per day of casting may be adequate. The results obtained are taken to represent all the fittings of all sizes made during the day.

Tests : Two tensile tests shall be made on bars cast from the same metal in accordance with the method specified in IS 2078 : 1979. The results of the tests shall show a minimum tensile strength of 150 Mpa (N/mm²).

D.15.8.4.6 Brinell Hardness Tests

For checking the Brinell hardness specified in clause 4.3 of IS 1538 : 1993, Brinell tests shall be carried out on the test bars used for the tests in 5.1 of the above code. The test shall be carried out by applying either a load of 3000 Kg to a ball of 10 mm diameter for 15 seconds, or a load of 750 Kg to a ball of 5 mm diameter for 10 seconds (see IS 1500 : 1983)

D.15.8.4.7 Retest

If any piece representing a lot fails in the first instance two additional tests shall be made on test pieces selected from two other fittings from the same lot. If both the test results satisfy the specified requirements, the lot shall be accepted. Should either of

these additional test pieces fail, the lot shall be deemed as not complying with this standard.

D.15.8.4.8 Hydrostatic Test

For hydrostatic tests, the fittings shall be kept under pressure for 15 seconds; they may be struck moderately with a 700 g hammer. They shall withstand the pressure test without showing any leakage, sweating or other defect of any kind. The hydrostatic test shall be conducted before coating the fittings.

The fittings shall withstand the pressure in Table below.

When fittings are required for higher test pressure, the test pressures are subject to special agreement between the purchaser and the manufacturer.

D.15.8.4.9 Sizes And Dimensions

The dimensions of fittings shall conform to those specified in Tables 2 to 28 as given under IS – 1538 – 1993.

Hydrostatic Test Pressure for Fittings

Nominal Diameter	Test Pressure	
	Fittings without branches or with branches not greater than half the principal diameter Mpa (N/mm ²)	Fittings with branches greater than half the principal diameter Mpa (N/mm ²)
Upto and including 300 mm	2.5 (25)	2.5 (25)
Over 300 mm and upto and including 600 mm	2.0 (20)	2.0 (20)
Over 600 mm and upto and including 1500 mm	1.5(15)	1.5(15)

D.15.8.4.10 Tolerances

Tolerances on external diameter of the barrel, the internal diameter and the depth of the socket for lead joints shall be as follows :

Dimension	Nature of Joint	Nominal Diameter (DN)	Tolerance mm
External diameter of spigot (DE)	Lead joints	All diameters	= $\frac{1}{2} f$ or = $(4.5 + 0.0015 DN)$
Internal diameter of socket (DI)	Lead joints	All diameters	= $\frac{1}{3} f$ or = $(3. + 0.001 DN)$
Depth of socket (P)	Lead joints	Upto and including 600 mm Over 600 mm up to and including 1000 mm Over 1000 mm up to and including 1500 mm	= 5 =10 =15

When DN is the nominal diameter of the fitting in millimetres and f is the caulking space of the joint in millimetres and is equal to $9.00 + 0.003 DN$.

Note : The jointing tolerances applicable to joints other than lead joints shall be as specified by their manufacture and shall be within the tolerances specified above.

The maximum or minimum jointing space resulting from these tolerances is such that the jointing of the pipes and fittings is not adversely affected.

The tolerances on the wall thickness and flange thickness of fittings are limited as follows :

Dimension Tolerance, mm

Wall thickness $-(2 + 0.05 e)$

Flange thickness $\pm (3 + 0.05 b)$

Where

e = the standard thickness of the wall in millimetres, and

b = the standard thickness of the flange millimetres

Tolerances on lengths

The tolerances on lengths of fittings, normally manufactured, shall be as follows :

Type of fitting	Nominal dia	Tolerance mm
Socket fittings and flange and spigot pieces	Upto and including 450 mm	= 20

	Over 450 mm	+20 -30
Flanged fittings	All diameters	=10

Should smaller tolerances be required, they shall be agreed to between the manufacturer and the purchaser and may not be less than = 1 mm.

D.15.8.4.11 Mass

The masses have been calculated by taking the density of iron as 7.15 KG/dm³. The standard masses shall conform to those given in Tables 7 to 28.

The permissible tolerances on standard mass of fittings shall be = 8 percent except for bends, fittings with more than one branch and non-standard fittings, in which case the tolerance shall be = 12 percent.

Fittings of a heavier mass than the maximum may be accepted provided they comply in every other respect with the requirement of this standard.

D.15.8.4.12 Coating

After inspection and hydrostatic test, each fitting shall be coated as follows.

Coating shall not be applied to any fitting unless its surface is clean, dry and free from rust.

Unless otherwise agreed between the purchaser and the manufacturer all fittings shall be coated externally and internally with the same material by dipping in a tar or suitable base bath. The fittings may be either preheated before dipping or the bath may be uniformly heated. Alternatively, if mutually agreed between the purchaser and the manufacturer, the fittings may be coated by spraying or brush painting.

The coating material shall set rapidly with good adherence and shall not scale off.

Where the coating material has tar or similar base, it shall be smooth and tenacious and hard enough not to flow when exposed to a temperature of 65° C but not so brittle at a temperature of 0° C as to chip off when scribed lightly with a penknife.

When the fittings are to be used for conveying potable water, the inside coating shall not contain any constituent soluble in such water or any ingredient which could impart any taste or odour whatsoever to the potable water after sterilization and suitable washing of the mains.

In the case of fittings (wholly or partially coated) which are imperfectly coated or where the coating does not set or conform to the required quality specified the coating shall be removed and the fittings re-coated.

D.15.8.4.13 Marking

Each fitting shall have cast, stamped or indelibly painted on it the following appropriate marks :

- a) Manufacturer's name, initials or identification mark ;
- b) The nominal diameter ;
- c) Mass of fitting ; and
- d) The last two digits for the year of manufacture.

Marking may be done on the outside of the socket or on the barrel of the fitting.

Any other mark required by the purchaser may be painted on.

D.15.8.4.14 Joints

The dimensions and designs for fittings suitable for lead joint and flanged joint covered in this standard should follow the design given in Tables 2 and 3 of IS 1538-1993. The dimensions of socket and spigot of pipes (lead joint) given in table is for reference.

D.15.9 VALVES

D.15.9.1 Sluice Valves, Ductile Iron (S.G. Iron), Double Flanged.

D.15.9.1.1 General

This specification describes design, construction, inspection and testing features of Ductile Iron (S.G. Iron) Sluice valves, double flanged conforming to IS- 14846 : 2000 or its latest edition, PN-1.0.

D.15.9.1.2 Codes and Standards

The design and manufacture of the valves shall comply with all applicable codes, standards, regulations and safety codes. Nothing in this specification shall relieve the Contractor of his responsibility. Valves shall be conforming to IS 14846-2000 or its latest edition.

D.15.9.1.3 Technical Data Sheet for Sluice Valves

Sr. No.	Particulars	Ductile Iron (S.G. Iron) Sluice Valves.
1.0	STANDARD 80 mm to 1200 mm	IS: 14846/2000, PN-1.0
2.0	Fluid	Clear Water
3.0	Rating	PN-1.0/10 Kg/cm ²
4.0	Stem	Non-Rising
5.0	Ends	Flanged, Flat Faced, Flanges as per IS: 1538 Table IV & VI having off-centre Bolt Holes.
6.0	Bonnet	Bolted
7.0	Wedge	Solid Wedge
8.0	Operation	CAP operated
9.0	Seat	Body Seat – Renewable Disc Seat – Renewable

Sr. No.	Particulars	Ductile Iron (S.G. Iron) Sluice Valves.
10.0	Other Requirement	Valves shall open in Clockwise Rotation of the Handwheel/Cap
11.0	Body Bonnet Disc	Ductile Iron (S.G.Iron) To BS 2789 Grade 500-7 Or IS 1865 G.R. 500/7 or SG 400/I2
D.15.0	Stem	Stainless Steel – IS:6603/AISI: 304
13.0	Body seat ring Wedge facing ring	Leaded Tin Bronze IS : 318, LTB-2
14.0	Bolts & Nuts	Carbon Steel, IS: 1363, CI. 4.0, Hot-dip Galvanised.
D.15.0	Gaskets	Rubber, IS:638, Type B
16.0	Gland Packing	Jute & Hemp
17.0	Shell Test	15 Kg/Cm ²
18.0	Seat Test	10 Kg/Cm ²
19.0	Back Seat Test	5 Kg/cm ² (in case of 450 mm & above S.V.)
	For 450 mm & Above Sizes Valves	
	a) Back Seat Bush :	Leaded Tin Bronze, IS:308, LTB-2
	b) Shoe & Channel :	Leaded Tin Bronze, IS:318, LTB-2
	c) Gear Housing :	Ductile Iron (S.G.Iron)
	GEAR :	Carbon Steel
20.0	Coating :	One coat of Red Oxide Primer – IS: 5660 Two Coat of Black Japan to IS: 341 or Paint conforming to IS: 9862/IS:2932. Alternatively, Electrostatically Powder coating inside & outside.

Direction of flow shall coincide with the flow direction indicated by “arrow” cast on the valve body.

D.15.9.1.4 Cleaning and Painting

Prior to factory inspection, all manufacturing waste such as metal chips, debris and all other foreign material shall be removed from the interior of the valve. All mill scale, rust, oil, grease, chalk and all other material shall be removed from the interior and exterior surfaces.

Valves shall first be given one coat of Red Oxide , as per IS: 5660 primer after completely cleaning the surface and then it shall be coated with two coats of Black Japan paint confirming to IS 341 or conforming to IS: 9862 / IS: 2932. Alternatively Electrostatically powder coating inside and outside. . The resulting coating shall be uniform and smooth and adhere perfectly to the surface.

The inside coating shall not contain any constituent soluble in water or any ingredient which could impart any taste or odour to the water.

D.15.9.1.5 Tests and Inspection

Valves shall be offered for visual inspection and dimensional check. The hydrostatic testing shall be witnessed by the Employer.

Valves shall be tested as per IS 14846-2000 or its latest edition.

Valve shall be dispatched only after Employer's approval for dispatch.

Valves shall be dispatched only after visual inspection and clearing instruction for dispatch.

ELECTRIC ACTUATORS

For Valves provided with Electric Operation, the Electric Actuator shall consist of the following :-

- i) AC Electric Motor rated for 415 V, 3 Ph. 50 Hz.
- ii) Reduction Gear Unit.
- iii) Torque Switch with Contacts.
- iv) Limit Switch with Contacts.
- v) Valve Position Indicator.
- vi) Handwheel for Manual operation.
- vii) Hand Auto Lever with locking arrangement.

Valve Actuator should be capable for producing not less than 1.5 times the required valve torque.

The Transmission Unit shall be designed to transmit twice the valve torque.

D.15.9.1.6 Fixing of Valves :

Loading at store and unloading at site of works shall be done carefully using suitable mechanical handling devices such as crane, chain pulley etc. The arrangement of housing the valves with chambers and stable and firm foundations. The chamber and top roof cover with removable lid shall be provided so that it shall be possible to remove or replace or recondition the valves seats and to remove the parts without removing the valves from the pipe work. For this suitable flange adapters may be provided.

Valves used on pipeline shall be straight through type and non chokable. Each valve or its operation equipment shall bear an approved name plate stating its function. All operation spindles, gears and head stocks shall be provided with adequate points for lubrications.

The tightening of nut and bolts shall be done smoothly in such a way that no excessive strain occurs on any one side. The nuts shall be tightened on diametrically opposite site at a time.

D.15.9.1.7 Information Required

Following documents / drawings shall be submitted by Bidder along with the quotation.

Preliminary outline dimensional drawings.

Typical cross section drawings.

Supplier's data sheet showing valve size, pressure rating, test pressures, list of tests to be conducted etc.

D.15.9.1.8 Payment

Payment shall be on number basis of the completed item.

D.15.9.2 Scour Valves

D.15.9.2.1 General

Specification of the Clause No. A-7.8.2.1 of sluice valves will be applicable to this item also and as directed by engineer-in-charge.

D.15.9.2.2 Ductile Iron, Kinetic type Double acting Air Valves (H-42K)

D.15.9.2.3 General

The double acting air valves shall have two ball chambers, having one outlet of large capacity for admission and release of bulk volume of air during emptying and filling of the main and another having small outlet for escape of smaller quantities of entrapped air. This type of air valves shall be of flanged type with full conformation with IS:1538.

The ball sealed orifice always remains open while air is exhausting and is immediately closed when water rises in the chamber, lift the ball and seals the orifice. It shall also ensure that there are no recesses or pockets, sheltering, escaping air for the large orifice (low pressure) valve to drop into when the valve is open. Turbulent air at the time of filling of pipe shall not circulate in such cavities and cause the ball to blown into when the valve is open. Turbulent air at the time of filling of pipe shall not circulate in such cavities and cause the ball blown into the discharging air streams, blowing the valve shut prematurely.

The cone angle of the lower pressure chamber shall be such that even at the critical velocity of air escape at 300 m/sec. The total impact force on the ebonite covered ball is less than the suction force on the angular area between the ball and the cone. The design of the valve should be such as to allow maximum free air discharge at various pressure differentials. The tenderer shall submit with the tender full set of curves showing discharge of free set of curves showing discharge of free air valves pressure differential for all sizes of valves offered by him.

Under no circumstances shall be large orifice ball blow shut prematurely.

The low pressure cover shall be massive and designed to withstand full operating thrust in working conditions.

Air valve shall be design to prevent premature closure prior to all air having been discharge from the line. The orifice shall be positively sealed in the close position but float (Ball) shall only be raised by the liquid and not by mixer of air and liquid. The sealing shall be design to prevent the floats sticking after long period in the close position.

All branched outlets including outlets for Air valves will be with compensation pads (Dia of Main / For branch Dia ratio greater than 3). Diameter of compensation pad will not be less than 1.75 times the O.d. of the branched outlet. Plate thickness for pads will be same that of the main.

For outlets with above ratio less than three, then the joints will be of plate reinforcement type.

All branched outlets including air valve tee's will be provided with one ½" BSP coupling duly plugged for measurement of pressure in due course. The closing plug will be in Stainless Steel (AISI 304 or equivalent) with Hex. Head. and will be provided with copper washer for sealing.

The neoprene seat ring shall be held securely in place under the low pressure cover by a joint support ring to prevent it from sagging when the ball is not sealing the office.

The valve body, the orifice cover, cowl of the air valves shall be made Ductile Iron.

Where tenderer considers necessary a suitable drain plug shall be provided.

D.15.9.2.4 Requirements of valves and its components shall be as per table below

ITEM NO	DESCRIPTION	MATERIAL SPECIFICATION
1	BODY (AIR VALVE)	D.I.GGG50/BS2789 GR.500/7 OR 420/12
2	HIGH PRESSURE COVER	D.I.GGG50/BS2789 GR.500/7 OR 420/12
3	LOW PRESSURE COVER	D.I.GGG50/BS2789 GR.500/7 OR 420/12
4	COWL	D.I.GGG50/BS2789 GR.500/7 OR 420/12
5	JOINT SUPPORT RING	NATURAL RUBBER
6	L.P.SEAT RING	NATURAL RUBBER
7	H.P. ORIFICE	G.M. IS 318, LTB-2
8	H.P. ORIFICE PLUG	C.S. IS 1363, CL-4.6
9	BALL FOR H.P. CHAMBER (FLOAT)	RUBBER COATED ON SEASONED WOOD
10	BALL FOR L.P. CHAMBER (FLOAT)	VULCANITE COATED ON SEASONED WOOD
11	GASKET	RUBBER IS 638, TYPE-B
12	BOLTS & NUTS	C.S. IS 1363, CL-4.6 / CL-4
13	BRACKET	d.I.GGG50/BS2789 GR.500/7 OR 420/12
14	OPERATING SHAFT	C. STEEL ROUND
15	BEVEL GEAR & PINION	C.I. IS 210, GR FG.200
16	SET SCREW	C. STEEL
17	STEM	S.S. AISI-410
18	GLAND STUFFING BOX	d.I.GGG50/BS2789 GR.500/7 OR 420/12
19	BONNET	d.I.GGG50/BS2789 GR.500/7 OR 420/12
20	WEDGE NUT	G.M. IS 318, LTB-2
21	WEDGE	d.I.GGG50/BS2789 GR.500/7 OR 420/12
22	WEDGE FACE RING	G.M.IS318,LTB-2
23	BODY SEAT RING	G.M.IS318,LTB-2
24	BODY (SLUICE VALVE)	d.I.GGG50/BS2789 GR.500/7 OR 420/12
25	HANDWHEEL/CAP	d.I.GGG50/BS2789 GR.500/7 OR 420/12

Valve generally conform to IS 14845 / 2000 PN-10.

Flanges drilled as per IS 1538 / BS 4504 / BS 10 / IS 6392.

Sluice Valves conform to IS 14846 / 2000 PN-10.

Face to face dimensions as per 'PD' of IS 14846

D.15.9.2.5 Jointing Material

Each valve shall be supplied with all necessary joint ring, nuts, bolts and washers for completing the joints such that it will ensure effective sealing of large orifice even at low pressures. The weights of floats of the same size and type shall not differ by more than 2%.

D.15.9.2.6 High Pressure Orifice

The high pressure orifice and the high pressure chamber shall be so designed that the orifice is effectively sealed in working conditions by "EPDM" coated float.

The material of the orifice shall be gunmetal. The orifice shall be of size not less than 3 mm and tapering to 100 mm suitable to release accumulated air within the pipe. The profile of the orifice shall be carefully chosen to avoid damage to the float surface. The orifice shall be protected by a suitable plug of stainless steel.

D.15.9.2.7 Valve Flanges

All valves flanges shall be designed to withstand the stresses to which they would be subjected under hydraulic tests. Flanges shall be machined flat. The flanges shall be drilled in accordance with IS:1538 (part – I to XXII) – 1976 (specifications for C. I. Fittings for pressure pipes for water etc.)

D.15.9.2.8 Coating

Prior to factory inspection, all manufacturing waste such as metal chips, debris and all other foreign material shall be removed from the interior of the valve. All mill scale, rust, oil, grease, chalk and all other material shall be removed from the interior and exterior surfaces.

Valves shall first be given one coat of Red Oxide , as per IS: 5660 primer after completely cleaning the surface and then it shall be coated with two coats of Black Japan paint confirming to IS 341 or conforming to IS: 9862 / IS: 2932. Alternatively Electrostatically powder coating inside and outside. . The resulting coating shall be uniform and smooth and adhere perfectly to the surface.

The inside coating shall not contain any constituent soluble in water or any ingredient which could impart any taste or odour to the water.

D.15.9.2.9 Testing

The air valves shall withstand 1.5 times the working pressure. The joints and air valve shall be water tight. During test if the joints of air valve are found leaking or the air valve is found not functioning properly then the same shall be got rectified or replaced by the contractor to the satisfaction of Engineer-in-charge.

D.15.9.2.10 Jointing Material

The contractor shall have to provide all the jointing material like bolts, nuts, lacking, branch (upto 1 Mt long) with flange, white zinc etc. at his cost.

D.15.9.3 Butterfly Valves Ductile Iron (S.G. Iron), Double flanged

D.15.9.3.1 General

This specification describes the design, construction, material, manufacture, performance and testing aspects of Ductile Iron (S.G. Iron) Butterfly valves, double flanged conforming to BS 5155 : 1984 / IS 13095 : 1991 or its latest edition, PN-1.0.

D.15.9.3.2 Codes and standards

The butterfly valves shall generally comply with one or more of the following codes and standards.

AWWA C 504 : Standard for Rubber Seated Butterfly Valves.

BS 5155 : Cast Iron and Carbon Steel Butterfly Valves for general purposes.

IS – 13095 –1991 – Butterfly Valves for General purpose

Other international standards, which may be equivalent or superior to those specified above, shall also be acceptable.

D.15.9.3.3 Performance Requirement

Butterfly valve and its operator shall be of heavy duty construction and shall be designed to withstand all working conditions i.e. shall be able to open, close or hold from / at any intermediate disc position, as required, without any difficulty under different combinations of flow and pressure.

Butterfly valves located within pumping stations shall be electric motor actuator operated. Butterfly valves installed on transmission mains shall be manually operated and provided with gear reducer for bigger sizes (350 NB and above).

During manual operation of valves (of smaller sizes, not provided with actuator or gear reducer), the maximum manual pull to be applied at the handwheel / lever shall be limited within twenty (20) KG.

Valves fitted with power pack unit shall automatically close / open or stayput in the event of disturbance in the system in which the valve is installed so that the “fail safe” criterion is satisfied.

D.15.9.3.4 Design and construction

General

The valve design shall take care of the pressure drop across the valve disc in case of partial opening of the valve and shall take care of the erosion and cavitation effect on the body and disc during such operation.

Valve(s) subjected to back pressure shall have the valve seat, disc and the operator suitably designed to ensure trouble – free operation.

The design of the valve shall take into consideration the water hammer effect in case of accidental closure of the valve disc.

Valve Body

Valve Body shall be of Ductile Iron (S.G. Iron) with flanged ends with water long face to face dimension. Hubs for housing the shaft bearing shall be integrally cast. Body thickness of valves (rubber seated) shall comply with Indian / BS standard.

Valve Shaft

Valve Shaft may be of single piece extending completely through the valve disc or it two pieces, stubbed into the disc hubs. The shaft diameter shall take into consideration the maximum torque required for the valve operation, the maximum differential pressure across the valve disc when the valve is closed and the shock load due to accidental closure of the valve disc.

Valve Disc

Valve Disc shall be of Ductile Iron (S.G. Iron), with no external ribs transverse to the direction of flow. The disc shall be designed for maximum differential pressure across the valve as well as the shock load due to accidental closure of the valve. Disc design shall offer minimum head loss. Disc shall also offer minimum resistance to flow. Disc shape shall be contoured. Disc head loss characteristic and flow discharge co-efficient shall be based on model test conducted.

Valve Seat

Valve seat shall be designed to provide bubble tight shut-off at all operating conditions. Valve seats shall be of a design that permits removal and replacement at site and shall be securely clamped on the body or disc of the valve. Seal shall be single piece design and bolted to disc using bolts passing through seals. Seat has to be designed as per Music Note or “Bulb” design for the required pressure rating.

Seat material shall be suitable for the operating conditions and handling fluid and may be suitably reinforced, if required.

The rubber seal design shall permit easy removal for replacement purposes without the need for removing the valve from the line. No deposited or welded seat rings permitted.

Valve Bearings

The valve shall be fitted with two sleeve type shaft bearings, contained in the hubs of the valve body. Bearings shall be of ‘self lubricate’ type and shall not have any harmful effect due to handling fluid.

Adjustable thrust bearing(s) shall be provided to hold the valve disc securely in the centre of the valve seat, when asked for in the data sheets.

Shaft Seals

Shaft Seals shall be provided both at drive and non-drive end of the shaft to prevent fluid flow to valve bearings. Shaft seals shall be of replaceable type and shall allow easy replacement with minimum dismantling of the valve components.

Valve Operators

Operator shall be used for opening, closing or holding the valve disc at the intermediate positions as and when required. Operator sizing shall be done on the basis of the maximum torque requirement of the valve for seating / unseating / holding the disc at the intermediate positions and the time required for valve operation.

Gear Reducers

Bigger size valve(S) which are difficult to be hand operated shall be supplied with suitable gear reducing device for easy operation. Design of the gear reducers shall conform to AWWA standard.

Actuators

Where required, butterfly valves shall be supplied along with an electric motor actuator for power operation, specification of the actuators shall comply with the specification of actuators.

Manual Operator

Irrespective of whether the valve is operated by a power actuator or not, each butterfly valve shall be provided with a handwheel for manual operation. The handwheel and associated gearing arrangement shall be designed to limit the maximum manual effort to around twenty (20) kgs for valve operation.

Valves located at in accessible position, shall be provided with extension spindle and floor stand or hand level / round chain as specified in data sheets, to facilitate manual operation.

Valve to be operated through gearing arrangements and / or by power actuator, shall be provided with adjustable mechanical stop limiting device to prevent overtravel of the valve disc in 'open' or 'closed' positions.

Position Indicator

The valve shall be provided with a mechanical position indicator and a scale to indicate 'open' 'close' or intermediate positions of the disc. An arrow mark on the handwheel shall be provided to indicate 'open' or 'close' direction.

Instrumentation

Apart from the mechanical position indicator on the valve, remote position indicator shall be provided for the electrically operated valves, The indicator shall be complete with position transmitter, panel indicator etc.

D.15.9.4 The butterfly valves and its component parts shall conform to the following requirements.

Sr. No.	Particulars	Ductile Iron (S.G. Iron) Butterfly valves
1	Standard	BS 5155 / IS 13095, PN-1.0
2	Fluid	Clear Water
3	Rating	10 Kg/cm ²
4	Ends	Flanged, flat faced, flanges as per IS : 1538 Table IV and VI having off centre bolt holes
5	Disc	Duo eccentrical
6	Operation	Gear operated
7	Body Disc	Ductile Iron (S.G. Iron) to BS 2789 Grade 500 – 7 / IS : 1865 Gr. 500/7.
8	Stem	S.S. AISI 431 / AISI 304.
9	Body seat	S.S. BS 970 Gr. 304
10	Disc seat	Nitrile rubber with SS retaining ring
11	Clamping ring	S.S. AISI 304
12	Bolts, studs and nuts	S.S.
13	Valve position indicator	Required
14	Opening	Clockwise
15	Body test	15 kg / cm ²
16	Disc test	10 kg / cm ²
17	Seat leakage test	10 kg / cm ²
18	Direction of flow	To be shown on body of the valve by arrow
19	Coating	One coat of red oxide primer – IS : 5660. Two coats of Black Japan to IS : 341 or paint conforming to IS : 9862 / IS : 2932. Alternatively, electrostatically powder coating inside and outside.

D.15.9.4.1 Inspection and conducting shop tests

Manufacturer shall conduct all tests and stage inspections required to ensure that the equipment offered by him conform to the specification requirements.

Test certificates for all shop tests shall be furnished to Employer for approval.

The Client may witness the tests, if he so desires.

D.15.9.4.2 Various Tests

Material test

Material to be used for the valve components shall be of tested quality. Chemical analysis and mechanical tests on materials to be used for forging and casting shall be done as per relevant standard.

Non-destructive Test

Valve body and disc shall be subjected to Non-destructive Testing (NDT). Components subjected to NDT and approved shall be stamped for identification.

Hydrostatic Test

Each valve body shall be subjected to hydrostatic test as specified in BS-5155/AWWA-C-504 and seat leak test as per BS-5155. For valves subjected to back pressure condition, leakage test shall be carried out on both sides of the disc.

Disc Strength Test

One valve of each size and category shall be subjected to disc strength test at a hydrostatic pressure of twice the maximum working condition for a period of minimum five (5) minutes.

Test shall be carried out with valve at tight shut condition and the other side open to atmosphere. For valves subjected to back pressure condition, disc strength test shall be carried out on both sides of the disc. Rubber seat shall be replaced after the test.

Performance Test

Each valve complete with operator shall be shop operated at least three (3) times from fully closed to fully open conditions and reverse, hold at intermediate positions under no flow condition, to prove the workability of the assembly.

Test At Site

D.15.9.5 Performance of the valves shall be tested at site at actual working condition, if specified in data sheet.

D.15.9.5.1 Cleaning

Prior factory inspection, all manufacturing waste such as metal chips debris and all other foreign matter shall be removed from interior of valve. All mill scale, rust, oil, grease, chalk and all other deleterious material shall be removed from the interior and exterior surfaces.

D.15.9.5.2 Painting

Valves shall first be given one coat of Red Oxide , as per IS: 5660 primer after completely cleaning the surface and then it shall be coated with two coats of Black Japan paint conforming to IS 341 or conforming to IS: 9862 / IS: 2932. Alternatively Electrostatically powder coating inside and outside. . The resulting coating shall be uniform and smooth and adhere perfectly to the surface.

The inside coating shall not contain any constituent soluble in water or any ingredient which could impart any taste or odour to the water.

D.15.9.5.3 Fixing of valves :

Loading at store and unloading at site of works shall be done carefully using suitable mechanical handling devices such as crane, chain pulley etc. The arrangement of housing the valves with chambers and stable and firm foundations. The chamber and

top roof cover with removable lid shall be provided so that it shall be possible to remove or replace or recondition the valves seats and to remove the parts without removing the valves from the pipe work. For this suitable flange adapters may be provided. Butterfly valves shall have high nitrile rubber seats, preferably metal reinforced, unless otherwise specified and shall be installed in the pipe work in such a manner that they can be removed from the line for dismantling and replacement of rubber seats.

Where the valves are required to be operated electrically, actuators shall be sized to guarantee valves closures at maximum possible differential pressure across the valve. Each actuator shall be supplied with installation, instructions and wiring diagrams and sufficient spare parts.

Valves used on pipeline shall be straight through type and non chokable. Each valve or its operation equipment shall bear an approved name plate stating its function. All operation spindles, gears and head stocks shall be provided with adequate points for lubrications.

The tightening of nut and bolts shall be done smoothly in such a way that no excessive strain occurs on any one side. The nuts shall be tightened on diametrically opposite site at a time.

D.15.9.5.4 Tender Drawings

The following documents shall be submitted by Bidder along with the quotation.

Preliminary outline dimensional drawings.

Typical cross section drawings.

Supplier's data sheet showing valve size, pressure rating, test pressures, list of tests to be conducted etc.

List of spares for two years.

D.15.10 LOWERING, LAYING AND FIXING DI (S. G. IRON) BUTTERFLY VALVES, SLUICE VALVES, AIR VALVES AND SCOUR VALVES INCLUDING TESTING OF VALVES

The butterfly valves will be supplied by AMC at AMC store or from the place as directed by AMC. The labour contractor will have to load the valves at store and unload the same at the site of work carefully using suitable mechanical handling devices such as crane, chain pully etc. The arrangement of housing the valves with chambers and stable and firm foundations. The chamber and top roof cover with removable lid will be provided so that it will be possible to remove or replace or recondition the valves seats and to remove the parts without removing the valves from the pipe work. For this suitable flange adapters may be provided. Butterfly valves will have high nitrile rubber seats, preferably metal reinforced, unless otherwise specified and will be installed in the pipe work in such a manner that they can be removed from the line for dismantling and replacement of rubber seats.

Where the valves are required to be operated electrically, actuators will be sized to guarantee valves closures at maximum possible differential pressure across the valve. Each actuator will be supplied with installation, instructions and wiring diagrams and sufficient spare parts.

Valves used on pipeline will be straight through type and non chokable. Each valve or its operation equipment will bear an approved name plate stating its function. All operation spindles, gears and head stocks will be provided with adequate points for lubrications.

The tightening of nut and bolts will be done smoothly in such a way that no excessive strain occurs on any one side. The nuts will be tightened on diametrically opposite site at a time.

The payment will be done on number basis of butterfly valve transported at the work site including all labour and materials required for fixing the valves in the chamber and in the pipeline.

D.15.11 VALVE CHAMBERS

The valves chambers consists the following items for construction.

- i) Excavation
- j) P.C.C. 1:3:6
- k) R.C.C. 1:1.5:3
- l) Providing and fixing HYSD bar reinforcement for RCC work
- m) Interior and exterior plain faced 15 mm thick cement plaster 1:3
- n) Providing and fixing fiber reinforced seat and heavy duty cover in line and level in CC 1:2:4
- o) Brick masonry in C.M. 1:5
- p) Providing and fixing cast iron steps confirming to IS 5455
- f) Excavation :

The excavation for chambers will be carried out as per the general technical specifications laid down under section “D-1”, “Work in Trench Excavation and Back Filling”. The excavation shall be carried out in all sorts of strata of soil and rock. The rate includes shoring, strutting and dewatering for which no extra payment will be made. The measurement shall be carried in length, Breadth and depth. The excess excavation carried out by the contractor will be filled with approved material for which no extra payment will be made. The excavation will be paid on cubic meter basis.

- g) P.C.C. 1:3:6 for foundation levelling course plain cement concrete proportion 1:3:6 shall be “Nominal Mix Concrete”. The general technical specification as laid down for Nominal Mix Concrete in section D-6, Concrete Works shall apply to the item also. P.C.C. 1:3:6 is to be carried out for levelling course of the chamber after excavation is carried out. P.C.C. 1:3:6 will be carried out as per dimension length, breadth and thickness given in drawings. No extra payment will be made for the concrete of larger dimensions executed than shown in the drawings.

The payment will be made on cubic meter of concrete carried out.

- h) R.C.C. 1:1.5:3 for base slab, pedestal walls and slabs

R.C.C. 1:1.5:3 for different components of chambers shall be “Mix Design” and the technical specifications as laid down under section D-6” concrete works for mix design shall also apply to this item. The necessary tests for mix – design shall

be carried out by contractor as directed by engineer in charge. The mix design for the concrete will be carried out by contractor at his cost. The payment will be made on cubic meter of concrete carried out.

i) Reinforcement – HYSD bars

The reinforcement shall be HYSD bar reinforcement for different components like walls, base slab and top slab of the chamber.

The general technical specifications as laid down under section D-6, “Concrete Works” sub head materials – Reinforcement specification for HYSD bars reinforcement shall apply to this item also. The HYSD bars shall be paid on weight basis i.e. MT and the weight will be arrived at using the standard weight per meter length of bar of each diameter.

j) Cement plaster 15 mm thick in C. M 1: 3

The cement plaster 15 mm thick in CM 1:3 is to be applied to inside of walls fully and from ground level to top of the manhole / chambers on outside.

Materials

The proportions of the cement mortar for plastering 15 mm thick shall be 1:3 (one part of cement to three parts of sand) unless otherwise specified under the respective items of work. Cement and sand shall be mixed thoroughly in dry condition and then just enough water added to obtain a workable consistency. The quality of water and cement grading of sand for plastering shall conform to IS : 1542. The mixing shall be done thoroughly in a mechanical mixer unless hand mixing is specifically permitted by the ENGINEER. If so desired by the ENGINEER Sand shall be screened and washed to meet the specification requirements. The mortar thus mixed shall be used as soon as possible preferably within 30 minutes from the time water is added to cement. In case the mortar has stiffened due to evaporation of water this may be re-tempered by adding water as required to restore consistency but this will be permitted only upto 30 minutes from the time of initial mixing of water to cement. Any mortar which is partially set shall be rejected and removed forthwith from the site. Droppings of plaster shall not be re-used under any circumstances.

Workmanship

Preparation of surfaces and application of plaster finishes shall generally conform to the requirements specified in IS : 1661 and IS : 2402.

Plastering operations shall not be commenced until installation of all fittings and fixtures in manhole /chambers are completed.

All joints in masonry shall be raked as the work proceeds to a depth of 10mm/20mm for brick/stone masonry respectively with a tool made for the purpose when the mortar is still green. The masonry surface to be rendered shall be washed with clean water to remove all dirt, loose materials , etc., concrete surfaces to be rendered suitably by hacking or bush hammering for proper adhesion of plaster and the surface shall be evenly wetted to provide the correct suction. The masonry surfaces should not be too wet but only damp at the time of plastering. The

dampness shall be uniform to get uniform bond between the plaster and the masonry surface.

Interior and exterior plain faced plaster this plaster shall be laid in single coat of 15 mm thickness. The mortar shall be dashed against the prepared surface with a trowel. The dashing of the coat shall be done using a strong whipping motion at right angles to the face of the wall or it may be applied with a plaster machine. The coat shall be trowelled hard and tight forcing it to surface depressions to obtain a permanent bond and finished to smooth surface. Interior plaster shall be carried out on jambs, lintel and sill faces, etc. as shown in the drawing and as directed by the Engineer. Rate quoted for plaster work shall be deemed to include for plastering of all these surfaces.

Wherever more than 20mm thick plaster been specified, which is intended for purposes of providing beading, bands, etc. This work shall be carried out in two or three coats as directed by the ENGINEER duly satisfying the requirements of curing each coat (rendering /floating) for a minimum period of 2 days and curing the finished work for atleast 7 days.

Where specified in the drawings, rectangular grooves of the dimensions indicated shall be provided in external still in green condition. Battens shall be carefully removed after the initial set of plaster and the broken edges and corners made good. All grooves shall be uniform in width and depth and shall be true to the lines and levels as per the drawings.

Curing of plaster shall be started as soon as the applied plaster has hardened sufficiently so as not to be damaged when watered. Curing shall be done by continuously applying water in a fine spray and shall be carried out for atleast 7 days.

The finished plaster surface shall not show any deviation more than 4 mm when checked with a straight edge of 2 m length placed against the surface.

To overcome the possibility of development of cracks in the plastering work following measures shall be adopted.

Plastering work shall be deferred as much as possible so that fairly complete drying shrinkage in concrete and masonry works takes place.

Measurement

Measurement for plastering work shall be in sq. m. correct to two places of decimal. Unless a separate item is provided for grooves, mouldings etc., these works are deemed to be included in the unit rates quoted for plastering work.

f) Heavy duty fibre cover with frame

The item includes providing and fixing heavy duty fibre reinforced seat and cover of approved quality and capacity. The same shall be fixed in line and level in C. C. 1:2:4 and will be finished smooth as directed by Engineer – in – charge. The

payment will be made on number basis. The rates includes transportation loading and unloading of the FRC Cover.

g) Brick Work

Materials

Bricks used in the works shall confirm to the requirements laid down in IS:1077. The class of the bricks shall be as specifically indicated in the respective items of work.

The nominal size of the modular brick shall be 200 mm x 100 mm x 100 mm with the permissible tolerances over the actual size of 190 mm x 90 mm x 90 mm as per IS : 1077. The nominal thickness of one brick and half brick walls using modular bricks shall be considered as 200 mm and 100 mm respectively. In the event of use of traditional bricks of nominal size 230 mm x 115 mm x 75 mm with tolerance upto +3 mm in each dimension, one brick and half brick walls shall be considered as 230 mm and 115 mm respectively.

Bricks shall be sound, hard, homogenous in texture, well burnt in kiln without being vitrified, hand / machine moulded, deep red, cherry or copper coloured, of regular shape and size & shall have sharp and square edges with smooth rectangular faces. The bricks shall be free from pores, cracks, flaws and nodules of free lime. Hand moulded bricks shall be moulded with a frog and those made by extrusion process may not be provided with a frog. Bricks shall give a clear ringing sound when struck and shall have minimum crushing strength of 5 N/sq.mm unless otherwise specified in the item.

The average water absorption shall not be more than 20 percent by weight upto class D.15.5 and 15 percent by weight for higher classes. Bricks which do not conform to this requirement shall be rejected. Over or under burnt bricks are not acceptable for use in the works.

Sample bricks shall be submitted to the Engineer for approval and bricks supplied shall conform to approved samples. If demanded by Engineer, brick samples shall be got tested as per IS : 3495 by Contractor at no extra cost to Owner. Bricks rejected by Engineer shall be removed from the site of works within 24 hours.

Fly Ash Bricks :

The bricks shall be hand or machine moulded and made from Fly ash, sand lime and additive. They shall be free from cracks, flaws. They shall have smooth rectangular faces with sharp corners and shall be uniform in colour. The bricks shall be machine moulded with a frog of size 100 mm. X 40 mm., and 10 mm. To 20 mm. Deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 6 m.

The size of the conventional bricks shall be (9"x4.4/8" x 2.3/4") 225 mm. X 110 mm. X 75 mm.

Only bricks of one standard size shall be used on a particular work site. The following tolerances shall be permitted in the conventional size adopted in a particular work site.

Length : + 1/8" (3.0 mm.) Width : + 1/6" (1.50 mm.) Height : + 1/6" (1.50 mm.)

The crushing strength of the bricks shall not be less than 35 Kg/cm². The average water absorption shall not be more than 15% by weight. Necessary tests for crushing strength and water absorption etc. shall be carried out as per IS : 3495 (Part I to IV) 1976.

Mortar for brick masonry shall consist of cement and sand and shall be prepared as per IS : 2250. Mix shall be in the proportion of 1:5 as specified for brickwork of thickness one brick or above and 1:4 for brickwork of thickness half brick or below, unless otherwise specified in the respective items of work. Sand for masonry mortar shall conform to IS : 2116. The sand shall be free from clay, shale, loam, alkali and organic matter and shall be of sound, hard, clean and durable particles. Sand shall be approved by Engineer. If so directed by the Engineer, sand shall be screened and washed till it satisfies the limits of deleterious materials.

For preparing cement mortar, the ingredients shall first be mixed thoroughly in dry condition. Water shall then be added and mixing continued to give a uniform mix of required consistency. Mixing shall be done thoroughly in a mechanical mixer, unless hand mixing is specifically permitted by the Engineer. The mortar thus mixed shall be used as soon as possible, preferably within 30 minutes from the time water is added to cement. In case, the mortar has stiffened due to evaporation of water, this may be tempered by adding water as required to restore consistency, but this will be permitted only upto 30 minutes from the time of initial mixing of water to cement. Any mortar which is partially set shall be rejected and shall be removed forth with from the site. Droppings of mortar shall not be re-used under any circumstances.

The Contractor shall arrange for test on mortar samples if so directed by the Engineer.

Workmanship

Workmanship of brick work shall conform to IS : 22D.15. All bricks shall be thoroughly soaked in clean water for at least one hour immediately before being laid. The cement mortar for brick masonry work shall be as specified in the respective item of work. Brick work 200 mm / 230 mm thick and over shall be laid in English Bond unless otherwise specified. 100 mm/115 mm thick brickwork shall be laid with stretchers. For laying bricks, a layer of mortar shall be spread over the full width of suitable length of the lower course. Each brick shall be slightly pressed into the mortar and shoved into final position so as to embed the brick fully in mortar. Only full size bricks shall be used for the works and cut bricks utilised only to make up required wall length or for bonding. Bricks shall be laid with frogs uppermost.

All brickwork shall be plumb, square and true to dimensions shown. Vertical joints in alternate courses shall come directly one over the other and be in line. Horizontal courses shall be leveled. The thickness of brick thick or half brick thick wall, atleast one face should be kept smooth and plane, even if the other is slightly rough due to variation in size of bricks. For walls of thickness greater than one brick both faces shall be kept smooth and plane. All interconnected brickwork

shall be carried out at nearly one level so that there is uniform distribution of pressure on the supporting structure and no portion of the work shall be left more than one course lower than the adjacent work. Where this is not possible, the work shall be raked back according to bond (and not saw toothed) at an angle not exceeding 45°. But in no case the level difference between adjoining walls shall exceed one metre. Brick work shall not be raised more than one metre per day.

Bricks shall be so laid that all joints are well filled with mortar. The thickness of joints shall not be less than 6 mm and not more than 10 mm. The face joints shall be raked to a minimum depth of 10 mm / 15 mm by raking tools during the progress of work when the mortar is still green, so as to provide a proper key for the plastering / pointing respectively to be done later. When plastering or pointing is not required to be done, the joints shall be uniform in thickness and be struck flush and finished at the time of laying. The face of brick work shall be cleaned daily and all mortar droppings removed. The surface of each course shall be thoroughly cleaned of all dirt before another course is laid on top.

During inclement weather conditions, newly built brick masonry works shall be protected by tarpaulin or other suitable covering to prevent mortar being washed away by rain.

Brickwork shall be kept constantly moist on all the faces for at least seven days. The arrangement for curing shall be got approved from the Engineer.

Double scaffolding having two sets of vertical supports shall be provided to facilitate execution of the masonry works. The scaffolding shall be designed adequately considering all the dead, live and possible impact loads to ensure safety of the workmen, in accordance with the requirements stipulated in IS : 2750 and IS : 3696 (Part I). Scaffolding shall be properly maintained during the entire period of construction. Single scaffolding shall not be used on important works and will be permitted only in certain cases as decided by the Engineer. Where single scaffolding is adopted, only minimum number of holes, by omitting a header shall be left in the masonry for supporting horizontal scaffolding poles. All holes in the masonry shall be carefully made good before plastering / pointing.

In the event of usage of traditional bricks of size 230 mm x 115 mm x 75 mm, the courses at the top of the plinth and sills as well as at the top of the wall just below the roof / floor slabs and at the top of the parapet shall be laid with bricks on edge.

All brickwork shall be built tightly against columns, floor slabs or other structural members.

To overcome the possibility of development of cracks in the brick masonry following measures shall be adopted.

For resting RCC slabs, the bearing surface of masonry wall shall be finished on top with 12 mm thick cement mortar 1:3 and provided with 2 layers of kraft paper grade 1 as per IS : 1397 or 2 layers of 50 micron thick polyethylene sheets.

RCC/ steel beams resting on masonry wall shall be provided with plain or reinforced concrete bed blocks of dimensions as indicated in the drawings duly finished on top with 2 layers of Kraft paper Grade 1 as per IS : 1397 or 2 layers of 50 micron thick polyethylene sheets.

Steel wire fabric shall be provided at the junction of brick masonry and concrete as specified elsewhere, before taking up plastering work.

The above item shall be measured and paid for separately under the respective items of work.

Where drawings indicate that structural steel sections are to be encased in brickwork, the brick masonry shall be built closely against the steel section, ensuring a minimum of 20 mm thick cement sand mortar 1:4 over all the steel surfaces. Steel sections partly embedded in brick work shall be provided with bituminous protective coating to the surfaces at the point of entry into the brick masonry.

Contractor shall note that the unit rates quoted for the masonry work shall be deemed to include for the installation of miscellaneous inserts such as pipe sleeves, bolts, steel sections with anchors etc. and providing pockets, leaving openings, cutting chases etc. in accordance with the construction drawings. Miscellaneous inserts shall be either supplied free by the owner or to be furnished by the contractor. Any of the miscellaneous inserts which are required to be fabricated and supplied by the Contractor and cement concrete to be provide in the pockets for the hold fasts of door / window frames etc. shall however, be measured and paid for separately under the respective items of work.

Measurement

Measurement shall be in cu.m. correct to two places of decimal for brickwork of thickness one brick i.e. 200 mm/230 mm and above. Measurement shall be in sq.m. correct to two places decimal for facing brickwork and brickwork of thickness half brick i.e. 100 mm / 115 mm and below. Measurement shall be for the quantities as actually executed duly deducting for openings, lintels, executed duly deducting for openings, lintels, transoms / mullions etc. All concrete works shall be measured and paid for separately under the respective items of work.

- h) Providing and fixing cast iron rungs / steps in chamber in line and levels etc. complete.

The C. I. Rungs / steps will be fabricated out of approved section of cast iron in concrete or masonry walls of chamber. The same shall be fixed at 35 cm. C/C and 35 cm staggered or as approved by Engineer in charge. The payment will be made on number basis.

D-16 : MISCELLANEOUS ITEMS

SECTION : D-16

D.16.1 Removing any kind of pavement incl. stacking of serviceable material disposal of unserviceable material with all lead and lift.

Demolishing work shall be carried out as per instructions given by the Engineer in charge. Demolishing of stone slab pavement or any other type of paving, proportion of cement or lime, sorting out materials, carting them up to lead of 50 mts. & Stacking the different materials separately as directed by the Engineer in charge of work. The work shall be done carefully.

D.16.2 Providing special superior quality of approved shape and size pre-cast M20 cement concrete interlocking blocks of 60mm th. Hydraulically pressed in machine of natural pigment or any colour suggested by AMC engg. in charge color for paving in flooring, footpath paving

The scope of work includes manufacturing, supplying of pre-cast paver blocks.

The work includes :

- 1.1 Manufacturing of paver blocks in your plant as per requirements of AMC's technical specification.
- 1.2 Supplying of paver blocks at site, including handling at both ends.
- 1.3 Testing of paver blocks through reputed Govt./Non Govt. Test house and submission of test results as per requirements in Technical Specifications. AMC reserves the right to carryout test at random. Cost for such tests to be borne by party incl. carting of materials.

TECHNICAL SPECIFICATIONS :

I) Paver Block Manufacturing Facilities: The Paver Block shall be made in factory with following minimum facilities & shall be got approved before carting materials to site.

- 1.1 Concrete Block making Machines : The machine should be capable of producing high quality Paver Blocks by obtaining high level of compaction by application of hydraulic compaction and also by high intensity vibration to the moulds. The machine should have automatic control panel for uniformity in strength.
- 1.2 Concrete Batching & Mixing The concrete mix design should be followed for each batch of materials separately and automatic batching plant is to be used to achieve uniformity in strength and quality.
- 1.3. Curing:
The factory should have well designed curing area to ensure adequate curing of paver blocks.
- 1.4 Laboratory (Desirable but not essential):
The factory should have the following:
 - (i) Compression testing machine of adequate capacity.
 - (ii) Other tools and equipment for testing raw materials and paver blocks.
 - (iii) (1). Systematic record of test results of various paver blocks manufactured in the factory.
 - (2). Concrete Mix Design for various grade of concrete used for making of paver blocks.

II) SPECIFICATIONS FOR COLOURED PAVER BLOCKS:

Coloured concrete paver blocks shall be manufactured as per specifications using approved colour Pigment of “BAYER” Make “BAYFERROX IRONOXIDE PIGMENTS” with minimum colour pigment of 3% by weight of cement. The colour shade shall be as selected by AMC before commencement of the work. White cement shall be used for colored pavers to obtain the desired colour shade. The colour of the paver block shall be guaranteed against fading of colour for period of 3 months from the date of completion. Otherwise contractor shall have to replace it without any cost. All other technical specifications & Procedure for testing & sampling of coloured pavers shall be as per attachment.

III) PAVERS BLOCK CHARACTERISTICS:

The concrete pavers should have perpendicularities after release from the mould and the same should be retained until the laying. The surface should be reasonably smooth and of anti skid and anti glare type. The paver should have uniform chamfers to facilitate easy drainage surface run off. The pavers should have uniform interlocking space of 2mm to 3mm to ensure compacted sand filling after vibration on the paver Surface. The pavers shall be manufactured in single layer only. The pavers shall be of cement grey colour without any pigment & for coloured pavers refer “specifications for coloured pavers.”

IV) Paver Block Dimensions :

Thickness 60mm

Shape Uniregular (Uniform Shape with no Hollow Or Creacks) Uni, I shape, tri hex or directed by Addl .C.E. Chamfer 4mm to 6mm along top edges Colour a. Natural cement grey colour without use of any pigment. b. For coloured pavers refer “specifications for coloured pavers” Dimensional Tolerance (+/-) 2mm for length & width, (+/-) 3mm for Height (Thickness)

V) Testing of Paver Blocks :

SR.

NO. * TEST

SPECIFICATION

Average Values

(Average of Minimum

Five Samples/Site)

1. Compressive Strength Min. 20 N/Sqmm for 65mm thick

2. Flexural Strength Minimum 4.5 N/Sqmm

3. Abrasion Resistance Maximum 1.5

4. Water Absorption Maximum 5.80%

* Sampling and Testing procedure as per enclosed specifications

SAMPLING AND TESTING PROCEDURES FOR PAVER BLOCKS.

Sample Size :

INTERNAL – Average of minimum 3 samples per 5000 Blocks. Essential – Minimum 2 Blocks per 10000 blocks. Average of minimum 8 blocks per site.

1. Sampling For Testing

Sampling for testing of paver blocks shall be done in accordance with Appendix-A.

2. Compressive Strength

Testing for compressive strength shall be undertaken in accordance with standard test as suggested by AMC.

3. Abrasion Resistance
Testing for abrasion shall be in accordance with IS 1237 (Specifications for Cement Concrete Floor Tiles)
4. Flexural Strength
Testing for flexural shall be in accordance with IS 1237 (Specifications for Cement Concrete Floor Tiles)
5. Water Absorption
Testing for water absorption shall be in accordance with IS 2185:1979 : Part I (Specifications for Concrete Masonry Units)
Appendix – A

Sampling of Paver blocks.

1. Method of sampling : Before laying paver blocks, each designated section comprising not more than 50000 blocks, shall be divided into ten approximately equal groups. Three blocks shall be drawn from each group. The mode of measurement shall be on Smt. basis. (As laid on site)

D.16.3 Labour work of fixing above interlocking blocks on up to 50 mm thick sand bedding, leveling, watering, and fixing. Rate includes average 30 cm depth for excavation and or filling, carting away debris / excavated materials up to 5 km and cleaning the site etc. complete as directed

Paver blocks shall be laid on up to 50mm th. sand bedding, leveling, etc. comp. Rate also includes up to 300 mm thick excavation and/ filling and carting away the same (derbies/excavated) materials upto 5 km. lead Excavation shall be done to the reqd depth & level & grade as shown to the contractor. The foundation bed should be watered and consolidated before the bedding is laid Blocks shall be laid in line and level as per design/pattern approved by AMC. in proportion of colored blocks. The job of laying may required to be carried out during night also. The mode of measurement shall be on Smt. basis.

D.16.4 Providing supplying and fixing kerb stone(M-20) edge having size of 300x150x280mm depth and as per design,conveying it to the site,jointing into CM 1:3 & racking out the joints incl. with necessary excavation of asphalt/soil or any type of materials,disposing of the unserviceable material with in 5.0km.lead etc.comp.as directed-(bewealdedged curb)

Laying :-

Trenches of specified width and depth shall first be mode along the edges of the wering course of the road or along the line of pave block flooring to receive the restraint block. The bed of the trenches shall be compacted manually with steel rammers o a firm an d even surface and then stones shall be set in P.C.C. The edge restraint blocks shall be laid with their length running parallet to the paving edge, true in line and gradient. The joints of blocks shall be not more than to mm and filled with the CM 1 :3 (1 cement : 3 fine sand/) which shall be cured for 7 days.

Finishing

The edge shall be restored and all surplus earth including rubbish etc. disposed off as directed by the engineer in charges.

Measurement Length of the finished work shall be measured in running meter along the edge of the paving correct to a cm.

Rate

The rate shall include the cost of the materials and labor including stone of specified materials involved in all the operation described above.

D-17 : SELF SUPPORTED ROOFING SYSTEM

SECTION : D-17

Providing and fixing of self supported roofing system with proper overlapping and seaming b/w different sheets without making holes preventing the overturning the roof by wind addition made of from superior quality, structural grade steel , base metal width 912 mm steel grade: Grade D and thickness 1.30 mm BMT, 1.35 mm TCT with tolerance of +/- 0.04mm , colour coated Galvalume steel only. Design, supply & fabrication of self supported single span arch roof fabricated from mechanically seamed manufactured by imported machines to profiles of colour coated Galvalume Cold Rolled Structural Steel coils as per standard ASTM A792 M, XMA3402, Coating-AZM-150 Tata BlueScope Steel Limited India with Reverse Branding every 1 meter along the length with SDP coating. The rate of item is including fitting as per standard specification and details drawing & directed by Engineer in Charge.