CORPORATION OF CHENNAI

S.W.D.C.No.B4/1179/2010

CONTRACT
TENDER, AGREEMENT SPECIFICATION
AND SCHEDULES

NAME OF WORK : -

Construction of storm water drain works in Adyar Water Shed in Chennai city.

TWO COVER SYSTEM

STORM WATER DRAIN DEPARTMENT S.E./SWDD
DATED **13.08.2010**

PRICE : Rs.16,875/- (Rupees Sixteen thousand Eight hundred and seventy five only)

(THIS TENDER DOCUMENT IS NOT TRANSFERABLE)

Signature of the Tenderer

CORPORATION OF CHENNAI

Construction of Storm Water Drains
in
Corporation of Chennai
under
Jawaharlal Nehru National Urban Renewal Mission's
Infrastructure Development Project

CONTRACT PACKAGE – Construction of storm water drain works in Adyar Water Shed in Chennai city.

Notice inviting tender for

(CIVIL WORKS)

NAME OF WORK	:	Construction of storm water drain works in Adyar Water Shed in Chennai city.
LAST SALE OF BIDDING DOCUMENT	:	**11.08.2010** UP TO 3.00pm
TIME AND DATE OF PRE-BID CONFERENCE	:	DATE **12.07.2010** TIME 4.00 pm
LAST DATE AND TIME FOR RECEIPT OF BIDS	:	DATE **13.08.2010** TIME UP TO 3.00 pm
TIME AND DATE OF OPENING BIDS	:	DATE **13.08.2010** TIME 3.30pm
PLACE OF OPENING OF BIDS	:	Office of the Chief Engineer (Bldgs & Brdgs), Corporation of Chennai, Ripon Building, Chennai-600 003.
OFFICER INVITING BIDS	:	The Superintending Engineer, Storm Water Drain Department, Corporation of Chennai, Ripon Building, Chennai-600 003.

Signature of the Tenderer

INVITATION FOR BID

(IFB)

Signature of the Tenderer

CORPORATION OF CHENNAI

NOTICE INVITING TENDER FOR

Construction of Storm Water Drains in Corporation of Chennai under Jawaharlal Nehru National Urban Renewal Mission's Infrastructure Development Project in Corporation of Chennai , Tamil Nadu State, India.

TWO COVER SYSTEM

Tender Notice No: S.W.D.C.No.B4/1179/2010 **Dated : 29.06.2010**

1. Ministry of urban development, Government of India has approved Storm Water Drainage Project in Corporation of Chennai under Jawaharlal Nehru National Urban Renewal Mission's Infrastructure Development Project (JNNURM).

2. Corporation of Chennai, in the form of grant of 35 % from the Government of India and with 15%of grant from the Government of Tamil Nadu and the balance 50% from the Urban Local body (ULB) contribution intends to cover eligible payments under the contract for storm water drainage construction in Chennai Corporation. The Corporation of Chennai on behalf of Government of Tamil Nadu invites bids for the construction of Storm Water Drainage works mentioned in the table I under the **Two cover system** from the contractors.

3. The bidder should be well established and reputed Civil Engineering Contractor, Registered as a Legal Entity in India for a minimum period of 5(Five) Years , and having experience of Minimum 5 (five) Years.

4. Bidders are advised to note the minimum qualification criteria specified in **Clause 4** of the Instructions to Bidders to qualify for the award of the contract.

5. However the successful Bidder has to register in Corporation of Chennai before issue of Work order.

5.

6. Bidding documents in English (and additional copies) can be purchased from **Tender sales counter, Ripon Buildings, Corporation of Chennai**, **Chennai-600 003** on all working days up to 3.00 P.M. till **11th August 2010 (11.08.2010)** on payment in the form of Demand Draft ,on any Scheduled bank payable at Chennai in favour of "**The Commissioner, Corporation of Chennai, Chennai** ". The cost of bidding document is given the table 1. Interested Bidders, may obtain further information **at the office of the The Superintending Engineer, Storm Water Drain Department, Corporation of Chennai, Chennai-600 003.**Bidding documents requested through mail (postal services) will be despatched by registered / speed post on payment of an extra amount of Rs 1000.00. The Commissioner, Corporation of Chennai, Chennai will not be held responsible for the postal delay. Bidding document is also available at *www.Chennaicorporation.gov.in, www.tenders.tn.gov.in* and can be downloaded at free of cost upto **11th August 2010 up to 3.00pm.** The downloaded tender documents shall be submitted without modification or insertion in the tender documents or otherwise tender will be liable for rejection. The downloaded tender document shall be submitted without cost of tender document.

7. Bids must be accompanied by security of the amount specified for the work in the table - 1 below. This bid security shall be drawn in favour of . "The Commissioner, Corporation of Chennai" and may be in one of the following forms:

   - Irrevocable bank guarantee in a prescribed format issued by a nationalized / scheduled bank located in India or a reputed bank located abroad (or)
   - Bank draft from Nationalized Bank/ scheduled bank.

   Bid security shall be valid for One hundred and twenty days beyond the validity of the bid.

8. **The filled up tender forms shall be dropped in any one of the tender boxes kept for this work at the following offices viz. tender sales Counter, office of the Public Relations officer, Office of the Vigilance Department and office of the Chief Engineer/General in the Ripon Buildings up to 3.00 pm.** on **13th August 2010 (13.08.2010)** and will be **opened on the same day at 3.30 pm**, in the presence of the bidders who wish to attend. If the office happens to be closed on the date of receipt of the bids as specified, the bids will be received and opened on the next working day at the same time and venue. The bidder should mention the following details in the top of the Bid Cover name of work (Ref: Table -1)

   Bids must be submitted in **two cover systems** Viz., **Technical** and **Financial** in two separate sealed envelopes with respective marking in bold letters. The first envelope marked as **Technical Proposal** should include the description of the firm/organization the qualification and competency etc., The first cover should not contain cost information whatsoever. The second envelope marked as **Financial Proposal** must also be sealed and initialled twice across the seal and should contain the detailed price offer for each item of the work. Both Technical Bid and Financial bid cover should

be submitted together in a wax sealed outer cover. Financial bid will be opened only if the tenderer is found qualified after evaluating the capability to execute the work, furnished in the first cover.

9. A **Pre bid meeting** will be held on **12th July 2010 (12.07.2010) at 4.00pm** at the office of Old Conference hall, Ripon Building, Corporation of Chennai, Chennai-3 to clarify the issues and to answer questions on any matter that may be raised at that stage as stated in Clause 9.2 of 'Instructions to Bidders' of the bidding document.

10. Superintending Engineer, Storm Water Drain Department, Corporation of Chennai may be contacted in person for any clarification on all working days from 2.00 P.M. to 5.00 P.M (or) over **Telephone no + 91 – 44 – 25619316** and **Tele Fax. No. 044 – 25383962**

11. Other details can be seen in the bidding documents.

12. If due date of tender happens to be Public Holiday, the tenders will be received up to 3.00 P.M. on the next working day.

TABLE 1

Sl.No/ Package No.	PWC. No.	Name of work	Approximate value of work (Rs. In Crores)	Bid security (Rs. Lakhs) 1% of value of work	Cost of document (Rs.)	Period of completion
1	**3367**	**S.W.D.C.NO.B4/1179/ 2010 Construction of storm water drain works in Adyar Water Shed in Chennai city.**	**52.21**	**52.22**	**16875**	**26 Months**

Signature of the Tenderer

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SECTION 1: INSTRUCTIONS TO BIDDERS (ITB)

Section 1: Instructions to Bidders

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A. General

1. Scope of Bid

1.1 On behalf of the Commissioner, Corporation of Chennai, (referred to as Employer in these documents) the Superintending Engineer, Storm Water Drain Department, Corporation of Chennai invites bids for the construction of works (as defined in these documents and referred to as "the works") detailed in the table given in IFB. The bidders may submit bids for any or all of the works detailed in the table given in IFB.

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

2. Source of Funds

The Government of India is funding for Improvement of Infrastructure in Urban limits under JNNURM Scheme and intends to apply a part of the funds to cover eligible payments under the contract for the Works. Corporation of Chennai, in the form of grant of 35 % from the Government of India and with 15%of grant from the Government of Tamil Nadu and the balance 50% from the Urban Local body (ULB) contribution intends to cover eligible payments under the contract for storm water drainage construction in Chennai Corporation.

3. Eligible Bidders

3.1 All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a statement that the Bidder is not associated, nor has been associated in the past, directly or indirectly, with the Consultant or any other entity that has prepared the design, specifications, and other documents for the Project or being proposed as Project Manager for the Contract. A firm that has been engaged by the Employer to provide consulting services for the preparation or supervision of Quality control and Quality Assurance of the works and any of its affiliates, shall not be eligible to bid.

3.2 Government-owned enterprises may only participate if they are legally and financially autonomous, operate under commercial law and are not a dependent agency of the Employer.

3.3 Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by the central government, state government or any public undertaking autonomous body.

4. Qualification of the Bidder

4.1 All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary.

4.2 In the event that Pre-qualification of potential bidders has been undertaken, only bids from prequalified bidders will be considered for award for Contract. These qualified bidders should submit with their bids any information updating their original prequalification applications or, alternatively, confirm in their bids that the originally submitted prequalification information remains essentially correct as of date of bid submission. The update or confirmation should be provided in Section 2.

4.3 If the Employer has not undertaken prequalification of potential bidders, all bidders shall include the following information and documents with their bids in Section 2:

(a) copies of original documents defining the constitution or legal status, place of registration, and principal place of business; written power of attorney of the signatory of the Bid to commit the Bidder;

(b) total monetary value of construction work performed for each of the last five years;

(c) experience in works of a similar nature and size for each of the last five years, and details of works under way or contractually committed; and clients who may be contacted for further information on those contracts;

(d) major items of construction equipment proposed to carry out the Contract;

(e) qualifications and experience of key site management and technical personnel proposed for the Contract;

(f) reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the past five years;

(g) evidence of adequacy of working capital for this contract (access to line (s) of credit and availability of other financial resources);

(h) authority to seek references from the Bidder's bankers;

(i) information regarding any litigation or arbitration resulting from contracts executed by the Bidder in the last five years or currently under execution. The information shall include the names of the parties concerned, the disputed amount, cause of litigation, and matter in dispute;

(j) If any of item of works found to be subcontracted and their performance not satisfied in the opinion of the Corporation of Chennai, the bidder should immediately terminate services of the subcontractor.

(k) the proposed methodology and program of construction including Environmental Management Plan, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones

4.4 **Joint ventures**

Joint venture has maximum of three members only. Any one of the member should be registered as a Legal Entity in India for a minimum period of 5(Five) Years. Any one of the member should be well established and reputed Civil Engineering Construction and carried out works in the last five years. Lead member should have a minimum of 51% of the share. However before entering into the agreement they should form special purpose vehicle.

It shall comply with the following requirements :

[a] the bid shall include all the information listed in Sub-clause 4.3 above;

[b] the bid and, in case of a successful bid, the Agreement, shall be signed so as to be legally binding on all partners;

[c] one of the partners shall be nominated as being in charge, and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the partners;

[d] the partner in charge shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture and the entire execution of the contract, including payment, shall be done exclusively with the partner in charge;

[e] all partners of the joint venture shall be liable jointly and severally for the execution of the contract in accordance with the contract terms, and a statement to this effect shall be included in the authorization mentioned under [c] above, as well as in the bid and in the Agreement [in case of a successful bid];

[f] The joint venture agreement should indicate precisely the role of all members of JV in respect of planning, design, construction equipment, key personnel, work execution, and financing of the project. All members of JV should have active participation in execution during the currency of the contract. This should not be varied/modified subsequently without prior approval of the employer;

[g] The joint venture agreement should be registered in Chennai so as to be legally valid and binding on partners; and

[h] a copy of the Joint Venture Agreement entered into by the partners shall be submitted with the bid. Alternatively, a Letter of Intent to execute a joint Venture Agreement in the event of a successful bid shall be signed by all partners and submitted with the bid, together with a copy of the proposed Agreement.

[Fill in the name of the city where contract agreement is to be signed]*

DETAILS OF PARTICIPATION IN THE JOINT VENTURE

PARTICIPATION DETAILS	*FIRM 'A'* *(Lead Partner)*	*FIRM 'B'*	*FIRM 'C'*
Financial			
Name of the Banker(s)			
Planning			
Construction Equipment			
Key Personnel			
Execution of Work (Give details on contribution of each)			

Signature of the Tenderer

4.5 <u>Eligibility Criteria</u>:

4.5 A. To qualify for award of the contract, each bidder in its name should have in the last five years *i.e for 2005-2006 to 2009-2010.*

(a) Achieved, at least in ONE financial year, a minimum annual financial turnover (in all classes of civil engineering construction works only) of <u>Rs. 52.21 crores.</u>

(b) Satisfactorily completed as a prime contractor, (or as subcontractor or duly certified by the employer) at least one work of a similar nature under a single contract (Bridges/Storm Water Drain /Buildings/Concrete road works) of value not less than <u>Rs.26.10 crores.</u>

(c) In anyone of the two Consecutive years minimum quantities of work as specified below should be completed.

Combination of PCC & RCC in 40740 Cu.m. (in two consecutive Years)

(d) Weightage

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 2009-2010 price level.

The following enhancement shall be used for the cost of works executed and the financial figures to a common base value for work completed.

Year	Factor of indexing
2009-10	1.00
2008-09	1.10
2007-08	1.21
2006-07	1.33
2005-06	1.46

The application will indicate actual figures of cost and amount in the schedule with out accounting for the above mentioned factors.

(e) The Bidder should have experience in civil works during last five years in any State Govt/ Central Govt/ Local bodies/ private institutional buildings.

4.5 B. Each bidder should further demonstrate:

(a) Availability (either owned or leased or by procurement against mobilization advances) of the following key and critical equipment for this work:

<u>Equipments and Machineries</u>

(i) Dumpy level	5 Nos.
Total station	2 Nos
Concrete mixer machine	10 Nos.
Needle vibrator with 40 mm needle	15 Nos.
Centring & shuttering material in steel	As required
JCB	4 Nos
Poclain	1 No
Float	1 No
Tipper Lorry	10 Nos
Hydrostatic testing machine	3 Nos
Dewatering Pump (25 HP)	7 Nos
Dewatering Pump (15 HP)	8 Nos
(ii) Concrete batching Plant (Capacity 25m^3 to 40 m^3 per Hour)	1 No
Transit Mixer	12 Nos

NOTE: Based on the studies, carried out by the Engineer the minimum suggested major equipment to attain the completion of works in accordance with the prescribed construction schedule are shown in the above list.

Signature of the Tenderer

The bidders should, however, undertake their own studies and furnish with their bid, a detailed construction planning and methodology supported with layout and necessary drawings and calculations (detailed) as stated in clause 4.3 (k) above to allow the employer to review their proposals. The numbers, types and capacities of each plant/equipment shall be shown in the proposals along with the cycle time for each operation for the given production capacity to match the requirements. Transit Mixer and Concrete batching plant should be either owned or hired in running condition . In case of hiring, Document and certificates from Notary Public should be attached and tenderer has to ensure the site in charge / QAQC to access the production unit area for quality check.

(b) Availability for this work of a Project Manager with not less than fifteen years' experience in construction of similar civil engineering works and other key personnel with adequate experience as required;

Position	Name	Qualifications	Years of experience (general)
One Project Manager		BE(Civil)	15
One Drainage Engineer		BE(Civil)	10
One Structural Engineer		BE(Civil)	10
Two Site Engineers		Diploma(civil)	10
One Testing personnel		B.Sc., (Chemistry)	3

The above Key personnel are minimum requirement. Further it is required that the bidder should have subordinate technical staff such as CIVIL/Mechanical Supervisor and field engineers, lab assistants/scientists, data entry operator programmers and other clerical support staff.

Liquid assets and/or availability of credit facilities to carryout **work Construction of storm water drain works in Adyar Water Shed in Chennai city of shall not be less than Rs.6.02 crores** in the format given in Section 2..
(Credit lines/letter of credit/certificates from Banks for meeting the funds requirement etc.)
In respect of bidders bidding more than one contract the available bid capacity will be calculated as per provision in **4.7(b).**

4.5 C. **To qualify for a package of contracts made up of this and other contracts for which bids are invited in the IFB**, the bidder must demonstrate having experience and resources sufficient to meet the aggregate of the qualifying criteria for the individual contracts.

4.6 Sub-contractors' experience and resources shall not be taken into account in determining the bidder's compliance with the qualifying criteria except to the extent stated in 4.5(A) above.(The certificate from the Employees should be attached.) The figures for each of the partners of a joint venture shall be added together to determine the Bidder's compliance with the minimum qualifying criteria of Sub-clause 4.5. However, for a joint venture to qualify, Lead member should have a minimum of 51 percent of the minimum criteria set in Sub-clause 4.5 above and all the partners collectively must meet the criteria specified in Sub-clause 4.5 above in full. **In case of Joint Venture any one of the member should Satisfactorily completed as a prime contractor, (or as subcontractor or duly certified by the employer) at least one work of a similar nature under a single contract (Bridges/Storm Water Drain /Buildings/Concrete road works) of value not less than Rs.26.10 crores.** Failure to comply with this requirement will result in rejection of the joint venture's bid.

4.7 **Bidders who meet the minimum eligibility criteria will be qualified only if their available bid capacity is more than the total bid value. The available bid capacity will be calculated as under:**

Assessed Available Bid capacity = (A*N*1.5 - B)

Where,

A = Maximum value of civil engineering works executed in any one year during the last five years (updated to 2009-2010 price level) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the works for which bids are invited. (26 Months)

B = Value, at 2009-2010 price level, of existing commitments and on-going works to be completed during the next 26 months

Note: ***The statements showing the value of existing commitments and on-going works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Engineer in charge, not below the rank of an Executive Engineer or equivalent.***

(a) Financial bids of various packages will be opened in different dates, starting from higher value of tender package sequentially. The date of opening of Financial Bids will be informed to all the eligible bidders.

(b) While evaluating the bid capacity in the opening of Financial bids of subsequent package, the bid value of lowest offer (L1) in other packages (Financial bids opened) value will also be taken in to account and will be treated as work on hand.

4.8 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

- made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or

- record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.; and/or

- participated in the previous bidding for the same work and had quoted unreasonably high bid prices and could not furnish rational justification to the employer.

5. One Bid per Bidder

5.1 Each bidder shall submit **only one bid for one work** either individually or as a partner in a Joint Venture' A bidder who submits **more than one bid for the same work will be liable for disqualification. In respect of bidders bidding more than one work the basic qualification for bidding will be decided on the total consolidated value of all the packages in Clause 4.5.**

6. Cost of Bidding

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

7. Site visit

7.1 COC has completed the detailed investigation, of Chennai Metropolitan Area for flood alleviation & mitigation and preparation of Detailed Project Report for Micro Drains & waterways of Chennai Corporation in Chennai Corporation limits and Macro Drainages & Waterways etc., of PWD with in Chennai Metropolitan area inclusive of project appraisal, approval etc., from JNNURM and other Funding agencies.
This project covers **93 no. of roads** at various locations it includes Construction of different sizes of drains. These construction works are to be carried out in busy roads and narrow lanes, which involves traffic management and permissions. Construction of Drains will be monitored by concerned Zonal Executive Engineers.

7.2 Every bidder is expected, before quoting his rates, to inspect the site of the proposed work. He should also inspect the quarries and satisfy himself about the quality and availability of materials. The best class of materials to be obtained from the quarries or other source shall be used on the work. In every case the materials must comply with the relevant specifications. Samples of materials as called for in the standard. specifications or as required by the SE/SWD DEPT/EE (zone) in any case shall be submitted for the SE/SWD DEPT / EE (zone) approval before the supply to site of work is begun.

The Commissioner, Corporation of Chennai, will not however, after acceptance of contract pay any extra charges for lead or for any other reason, in case the contractor is found later on to have misjudged the quality or quantity of materials available. Attention of the bidder is directed to the preliminary specifications herein regarding payments of seignior age, tolls, etc. (The successful tenderer will not be exempted from the payment of any Municipal duty or taxes in consequences of being contractor for the Corporation).

B. Bidding Documents

8. Content of Bidding Documents

8.1 The set of bidding documents comprises the documents listed in the table below and addenda issued in accordance with Clause 10:

Invitation for Bids

Section	1	Instructions to Bidders
	2	Forms of Bid and Qualification Information
	3	Conditions of Contract
	4	Contract Data
	5	Specifications
	6	Drawings& Locations
	7	Bills of Quantities
	8	Forms of Securities
	9	Pre qualifications

8.2 Bidding documents supplied, original with a copy should be completed and returned with the bid.

9. Clarification of Bidding Documents

9.1 A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing or by cable (hereinafter "cable" includes telex and facsimile) at the Employer's address indicated in the invitation to bid. The Employer will respond to any request for clarification which he received earlier than 48 hours prior to the deadline for submission of bids. Copies of the Employer's response will be forwarded to all purchasers of the bidding documents, including a description of the enquiry but without identifying its source.

9.2 Pre-bid meeting

9.2.1 The bidder or his official representative is invited to attend a pre-bid meeting which will take place at the office of Old Conference Hall, Ripon Building, Corporation of Chennai on 12th July 2010 at 4.00 P.M

9.2.2 The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

9.2.3 The bidder is requested to submit any question in writing or by cable to reach the Employer not later than 3 days before the meeting.

9.2.4 Minutes of the meeting, including the text of the questions raised(without identifying the source of enquiry) and the responses given will be transmitted without delay to all purchases of the bidding documents. Any modification of the bidding documents listed in Sub-Clause 8.1 which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause 10 and not through the minutes of the pre-bid meeting.

9.2.5 Non- attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

10. Amendment of Bidding Documents

10.1 Before the deadline for submission of bids, the Employer may modify the bidding documents by issuing addenda.

10.2 Any addendum thus issued shall be part of the bidding documents and shall be communicated in writing or by cable to all the purchasers of the bidding documents. Prospective bidders shall acknowledge receipt of each addendum by cable to the Employer.

10.3 To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer shall extend as necessary the deadline for submission of bids, in accordance with Sub-Clause 20.2 below.

C. Preparation of Bids

11. Language of the Bid

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

12. Documents comprising the Bid

12.1 The bid submitted by the bidder shall comprise the following:

(a) The Bid (in the format indicated in Section 2).
(b) Bid Security;
(c) Priced Bill of Quantities;
(d) Qualification Information Form and Documents;

and any other materials required to be completed and submitted by bidders in accordance with these instructions. The documents listed under Sections 2, 4 and 7 shall be filled in without exception.

13. Bid Prices

13.1 The contract shall be for the whole works as described in Sub-Clause 1.1, based on the priced Bill Quantities submitted by the Bidder.

13.2 The bidder shall fill in rates and prices and line item total (both in figures and words) for all items of the Works described in the **Bill of Quantities** along with total bid price (both in figures and words). *Items for which no rate or price is entered by the bidder will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities.* Corrections, if any, shall be made by crossing out, initialling, dating and rewriting.

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

13.4 RATES TO INCLUDE

The tendered rates for the items should be inclusive of all items of works required for the proper execution of the items (viz) watering, lighting, watching, safety arrangements in the interest of traffic, safeguarding the underground services etc, and no claim for extra payment on any score will be entertained. The rates to be tendered should be inclusive of sales tax and other taxes in force.

13.5 The rates and prices quoted by the bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of Clause 47 of the Conditions of Contract

14. Currencies of Bid and Payment

The unit rates and the prices shall be quoted by the bidder entirely in Indian Rupees.

15. Bid Validity

15.1 Bids shall remain valid for a period not less than **One hundred and Twenty days** after the deadline date for bid submission specified in Clause 20. A bid valid for a shorter period shall be rejected by the Employer as non-responsive.

15.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the bidders may extend the period of validity for a specified additional period. The request and the bidders' responses shall be made in writing or by cable. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his bid security for a period of the extension, and in compliance with Clause 16 in all respects.

15.3 Bid evaluation will be based on the bid prices without taking into consideration the above correction

16. Bid Security

16.1 The Bidder shall furnish, as part of his Bid, a Bid security in the amount as shown in column 5 of the table 1 of IFB for this particular work.

This bid security shall be drawn in favour of . "The Commissioner, Corporation of Chennai" and may be in one of the following forms:

- **Irrevocable bank guarantee in a prescribed format issued by a nationalized / scheduled bank located in India or a reputed bank located abroad in the form given in Section 8; (or)**

- **Bank draft from Nationalized Bank/ scheduled bank in favour of The Commissioner, Corporation of Chennai, payable at Chennai.**

16.2 Bank guarantees issued as surety for the bid shall be valid for **one hundred and twenty days** beyond the validity of the bid.

16.3 Any bid not accompanied by an acceptable Bid Security and not secured as indicated in Sub-Clauses 16.1 and 16.2 above shall be rejected by the Employer as non-responsive.
'The bid security of a joint venture must define as 'bidder' all joint venture partners and list them in the following manner : a joint venture consisting of '…….', '…….', and '…….'.

16.4 The Bid Security of unsuccessful bidders will be returned within 28 days of the end of the bid validity period specified in Sub-Clause 15.1.

16.5 The Bid Security of the successful bidder will be discharged when the bidder has signed the Agreement and furnished the required Performance Security.

16.6 The Bid Security may be forfeited

(a) if the Bidder withdraws the Bid after Bid opening during the period of Bid validity;

(b) if the Bidder does not accept the correction of the Bid Price, pursuant to Clause 27; or
(c) in the case of a successful Bidder, if the Bidder fails within the specified time limit to

(i) sign the Agreement; or
(ii) furnish the required Performance Security.

17. Alternative Proposals by Bidders

17.1 Bidders shall submit offers that comply with the requirements of the bidding documents, including the basic technical design as indicated in the drawing and specifications. Alternatives will not be considered.

18. Format and Signing of Bid

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

18.2 The Bidder shall prepare one original and one copy of the documents comprising the bid as described in Clause 12 of these *Instructions to Bidders*, bound with the volume containing the Form of Bid, and clearly marked "**ORIGINAL**" and "**COPY"** as appropriate. In the event of discrepancy between them, the original shall prevail.

18.3 The original and copy of the Bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder, pursuant to Sub-Clauses 4.3. All pages of the bid where entries or amendments have been made shall be initialled by the person or persons signing the bid.

18.4 The Bid shall contain no alterations or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the bidder, in which case such corrections shall be initialled by the person or persons signing the bid.

18.5 The Bidder shall furnish information as described in the Form of Bid on commissions or gratuities, if any, paid or to be paid to agents relating to this Bid, and to contract execution if the Bidder is awarded the contract.

18.6 No alteration which is made by the tenderer in the contract form, the conditions of the contract, the drawings, specifications or statements / formats or quantities accompanying the same will be recognised; and, if any such alterations are made the tender will be void.

D. Submission of Bids

19. Sealing and Marking of Bids

19.1 There shall be two parts for the bids, Part "A" and Part "B". The part 'A' shall contain Technical- part of the bid and Part "B" shall contain Financial part of the bid. The Bidder shall enclose the original and one photocopy of Part A in one envelope marking it as, Envelope-A, TECHNICAL BID- **ORIGINAL-** and **COPY. He will then enclose the original and one photocopy of Part-B in another envelope marking it as Envelope- B , FINANCIAL BID ORIGINAL- and COPY.** These envelopes (called as inner envelopes) shall then be put inside one outer envelope.

Part 'A', Technical BID of the bid shall contain,

i Bid Security as per tender requirement. If the Bid Security is not deposited the tender shall be declared as non-responsive and rejected.
ii The Qualification Information indicated in Section 2, and item 4 of section 1 duly filled in original and photocopy
iii A forwarding letter (in duplicate) form the Tenderer shall clearly stating in the forwarding letter (in duplicate) to be enclosed with the tender document, the deviation from general terms` and conditions, if any, with cross references. If no such letter is received, it will be presumed that the tenderer agrees entirely with the General terms and Conditions.
iv. Originals only of Book-1 Invitation for Bid, Book-2, Specifications and Book-3 Drawing volume duly stamped and initialled on each page by the tenderer as proof of their having scrutinized the documents.

Part B Financial bid shall contain

i Form of Bid duly filled in original plus photocopy

ii The bidder shall fill in rates and prices and line item total (both in figures and words) for all items of the Works described in the **Bill of Quantities** along with total bid price (both in figures and words).

19.2 The **inner and outer** envelopes shall

(a) be addressed to the Employer's representative at the following address:
The Superintending Engineer,
Storm Water Drain Department,
Corporation of Chennai, Chennai

and

(b) Envelope bear the following identification:

Name of work :. Construction of storm water drain works in Adyar Water Shed in Chennai city.

Bid Reference: S.W.D.C.No.B4/1179/2010

DO NOT OPEN BEFORE 3.30 pm on 13th August 2010

19.3 In addition to the identification required in Sub-Clause 19.2, the inner envelopes shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared late, pursuant to Clause 21.

19.4 If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the bid.

20. Deadline for Submission of the Bids

20.1 Bids must be received by the Employer at the address specified in the IFB (Para 8) no later than **3.00 pm** on **13th August 2010.** In the event of the specified date for the submission of bids declared a holiday for the Employer, the Bids will be received up to the appointed time on the next working day.

20.2 The Employer may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 10, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will then be subject to the new deadline.

21. Late Bids

21.1 Any Bid received by the Employer after the deadline prescribed in Clause 20 will be returned unopened to the bidder.

22. Modification and Withdrawal of Bids

22.1 Bidders may modify or withdraw their bids by giving notice in writing before the deadline prescribed in Clause 20.

22.2 Each Bidder's modification or withdrawal notice shall be prepared, sealed, marked, and delivered in accordance with Clause 18 & 19, with the outer and inner envelopes additionally marked "**MODIFICATION**" or "**WITHDRAWAL**", as appropriate.

22.3 No bid may be modified after the deadline for submission of Bids.

22.4 Withdrawal or modification of a Bid between the deadline for submission of bids and the expiration of the original period of bid validity specified in Clause 15.1 above or as extended pursuant to Clause 15.2 may result in the forfeiture of the Bid security pursuant to Clause 16.

22.5 Bidders may only offer discounts to, or otherwise modify the prices of their Bids by submitting Bid modifications in accordance with this clause, or included in the original Bid submission.

22.6 POWERS FOR REJECTION OF TENDER

The Tender Accepting Authority reserves the right to reject any tender or all renders in exercise of the power conferred by section 12(1) and (2) of TNIT Act subject to the provisions of sub section (1) and (2) of section 12 of TNIT Act 1998.

E. Bid Opening and Evaluation of Technical Bids

23. Opening of the Cover I of all Bidders and evaluation to determine qualified Bidders

23.1 The Employer will First open the Big Cover containing the **Covers 1 and 2** at the time and date given in the IFB Para 8 including the modifications made pursuant to Clause 22 in the presence of those Bidders or their authorized Representatives who shall sign the Register as proof of their attendance. In the event of the specified date of the Bid opening being declared as a holiday for the Employer the Bids will be opened at the appointed time and venue on the next working day.

23.2 After opening the big Cover, the **Cover–1,** "Technical Bid" will then be opened.

23.2.1 Covers Marked "Withdrawals" for "Technical Bids" shall be opened and read out. Bids for which an acceptable notice of withdrawal has been submitted, pursuant to Clause 22, shall not be opened.

23.2.2 Then the Employer will read out the details of Bid security and other such details as he may consider appropriate and the Employer will prepare minutes of the Bid opening.

23.3 The Cover-2 – Financial Bid of all Bidders shall remain sealed and securely stored in the safe custody of the Employer.

23.4 The Employer will make a preliminary examination of the Technical Bids to determine whether (1) they are complete, (2) the required Bid security in the form specified under Clause 16 of ITB, are furnished, (3) the documents are properly signed and (4) the Bids are generally in order.

23.5 Any Bid found to be not meeting the qualification criteria specified in Clause 4.5 of ITB (such as required Bid security, Power of Attorney, Certificate of Bid validity period etc.) will be rejected by the employer and not included for further evaluation.

23.6 The Employer will carry out a detailed evaluation of the Bids in order to determine whether the qualification and experience details furnished meet with the requirements set forth in the Bid documents. In order to reach such determination the employer will examine the information supplied by the Bidders pursuant to ITB Clause 4.1 to 4.7 and other requirements in the Bid documents.

23.7 If any clarification (additional information) is required from the Bidder by the Employer a letter seeking clarification will be sent by the Employer to the Bidder to respond.

23.8 If the Bidder furnishes the required details within the time prescribed by the Employer the same will be considered by the Employer and scrutiny and evaluation will be completed and in the event of the Bidder failing to respond within the time period the Employer will scrutinize and evaluate with the data as submitted with the Bid.

Opening of Cover – 2 "Financial Bid"

23.9 The Employer will open the **Cover – 2** " Financial Bids" including modifications made pursuant to Clause 22 of the qualified Bidders of "Technical Bid" in the presence of the Bidders or their authorized representatives who choose to attend at the time , date and venue of the opening specified in the information as per Clause 24.2 and sign a Register in token of their attendance. In the event of the specified date of Bid opening being declared a holiday for the Employer, the Bids will be opened at the appointed time and location on the next working day.

23.10 The Employer shall read out the submissions in the modification proposals in appropriate detail.

23.11 The Bidders names, the Bid prices/ percentage quoted , the total amount of each Bid, any discount(s), modification, withdrawal, the presence or absence of Bid security and other details shall be announced by the Employer at the opening. Late and withdrawn Bids will be returned unopened to Bidder concerned.

23.12 The Employer will prepare minutes of the Bid opening including the information disclosed to those present in accordance with Clause 23.11

24. Process to be confidential.

24.1 Information relating to the examination, clarification and evaluation of the Technical Bid shall not be disclosed to any Bidders or any other persons not officially concerned with such process until the final decision on the Bid is made. Any effort by a Bidder to influence the Employers' processing of Bids / decisions shall result in rejection of Technical Bid of that Bidder.

24.2 On completion of evaluation of the Technical Bid, final decision will be communicated to the concerned Bidders and the qualified Bidders will be informed of the date, time and venue of the opening of the financial Bid (Cover 2) by giving 7 (seven) days notice.

25. Clarification of Bids

25.1 To assist in the examination, evaluation, and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his Bid, including breakdowns of the unit rates. The request for clarification and the response shall be in writing or by cable, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids in accordance with Clause 27.

25.2 Subject to sub-clause 25.1, no Bidder shall contact the Employer on any matter relating to its bid from the time of the bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Employer, it should do so in writing.

25.3 Any effort by the Bidder to influence the Employer in the Employer's bid evaluation, bid comparison or contract award decisions may result in the rejection of the Bidders' bid.

26. Examination of Bids and Determination of Responsiveness

26.1 The Employer will have preliminary examination of Cover – 2 "Financial Bids" to determine whether they are complete, whether any computational errors have been made, whether the documents are properly signed and whether the Bids are substantially responsive to the requirements of the Bid Documents.

26.2 A substantially responsive Bid is one which conforms to all the terms, conditions and specifications of the Bid documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality or performance of the works (b) which limits in any substantial way, is inconsistent with the Bid documents, the Employer's rights or Bidder's obligations under the contract or (c) whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids.

26.3 If a Bid is not substantially responsive, it will be rejected by the employer and may not subsequently be made responsive by correction or withdrawal of the non conforming deviation or reservation.

27 Correction of Errors

27.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:

Item Rate Contract:

(a) where there is a discrepancy between the rates in figures and in words, lesser of the two will govern; and

(b) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.

27.2 The amount stated in the Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and ,such corrections shall be considered binding on the Bidder. If the Bidder does not accept the corrected amount the Bid will be rejected and the Bid security shall be forfeited in accordance with sub-clause 16.6 (b).

28. Evaluation and Comparison of Financial Bids

28.1 The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Clause 26 and ITB Clause 4.

28.2 In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:

(a) making any correction for errors pursuant to Clause 27 and
(b) making appropriate adjustments to reflect discounts or other price modifications offered in accordance with sub Clause 22.5
(c) making an appropriate adjustments for any other acceptable variations, deviations;

28.3 The Employer reserves the right to accept or reject any variation, deviation, or alternative offer. Variations, deviations, and alternative offers and other factors which are in excess of the requirements of the Bid documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Bid evaluation.

28.4 The estimated effect of the price adjustment conditions under Clause 47 of the *Conditions of Contract*, during the period of implementation of the Contract, will not be taken into account in Bid evaluation.

28.5 If the Bid of the successful Bidder is seriously unbalanced in relation to the Engineer's estimate of the cost of work to be performed under the contract, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require that the amount of the performance security set forth in Clause 34 be increased at the expense of the successful Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

29 Negotiations

29.1 The Bids determined to be substantially responsive in accordance with Clause 28 will be taken into consideration and the rates of all the items and the total Bid value quoted by the Bidder will be compared with the estimate rates and total estimate value put to Bid. Where considered necessary the employer may invite the lowest Bidder for negotiations as outlined below:

29.2 The Employer may seek break up detail from the lowest responsive Bidder for the rates quoted for the unbalanced items and total Bid amount offered by the Bidder within 10 days time. The Bidder may also be requested to examine the possibility of reducing the rates of high pitched items quoted and the Bid amount to the extent possible.

29.3 Then the lowest Bidder has to furnish the breakdown details as required by the Employer within the time limit fixed by the Employer. The Bidder may also reduce the rates of the high-pitched items quoted / high percentage quoted if possible or express his inability to reduce the quoted rates/ percentage rate stating the reasons. A reply shall be furnished within the time limit fixed by the Employer.

29.4 If the Employer is satisfied that the details furnished and the reasons stated by the Bidder for his inability to reduce the rates /percentage by the Bidder are reasonable then he may take a decision suitably.

29.5 If the Employer feels that the reduced offer is reasonable, suitable action shall be taken to award the work and if the reduced rates offered / percentage rate even after negotiation is considered still to be on the higher side and if the Bidder refuses to reduce further then the Employer may record the reasons and take suitable action to reject the Bids received and to go in for re-Bid

29.6 In the event of deciding the award of the lowest evaluated Bidder with unbalanced rates for certain items / percentage which has resulted in the Bid amount being very much less than the estimated value put to Bid, to safeguard the interest of the Employer and to ensure the completion of the work by the Bidder.

30. Performance security deposit..

Within 21 days of receipt of the Letter of Acceptance, the successful Bidder shall deliver to the Employer a Performance Security in any of the forms given below for an amount equivalent to the percentage specified below.

As per the Council Resolution No. 584/86 dt. 21.5.86 the percentage of Security deposit to be fixed for various percentage of rebates are as follows:

Percentage of rebate	**Percentage of security Deposit to be fixed**
Up to 10%	2%
10 to 20%	3%
20 to 30%	4%
Above 30%	5%

Performance security shall be drawn in favour of "The Commissioner, Corporation of Chennai" and may be in one of the following forms:

- Irrevocable bank guarantee in a prescribed format issued by a nationalized / scheduled bank located in India or a reputed bank located abroad in the form given in Section 8; for the whole period of contract + Defects liability period + 28 days or

- Bank draft from Nationalized Bank/ scheduled bank in favour of "The Commissioner, Corporation of Chennai" payable at Chennai

Additional Performance Security Deposit

As per Council Resolution N. 456/2002, Dt : 28-11-2002 the amount of Additional Performance Security Deposit to be paid by the Contractor along with the tender for various percentage of rebate are as follows:

Percentage of rebate	**Amount of Additional Security Deposit payable in the form of Demand Draft**
5 to less than 15%	2%
15% to 20%	50% of Difference between Office value of work and Tender amount.
above 20%	Same as above

Additional Performance security shall be drawn in favour of "The Commissioner, Corporation of Chennai" and may be in one of the following forms:

- Irrevocable bank guarantee in a prescribed format issued by a nationalized / scheduled bank located in India or a reputed bank located abroad in the form given in Section 8; for the whole period of contract + 45 days or

- Bank draft from Nationalized Bank/ scheduled bank in favour of "The Commissioner, Corporation of Chennai" payable at Chennai

If percentage of rebate is above 20% tenderer should furnish the break up details, cost analysis and documents to show previous experience and work on hand with performance certificate showing the satisfactory completion of works entrusted.

If the percentage quoted by a tenderer is found to be either abnormally high or with in the permissible ceiling limits prescribed but under collusion or due to unethical practices adopted at the time of tendering process, such tenders shall be rejected.

A tenderer submitting a Tender which the tender accepting authority considers excessive and or indicative of insufficient knowledge of current prices or definite attempt of profiteering will render himself liable to be debarred permanently from tendering or for such period as the tender accepting authority may decide

F. Award of Contract

31. Award Criteria

31.1 Subject to Clause 32, the Employer will award the Contract to the Bidder whose Bid has been determined to be substantially responsive to the Bidding documents and who has offered the lowest evaluated Bid Price, provided that such Bidder has been determined to be (a) eligible in accordance with the provisions of Clause 3, and (b) qualified in accordance with the provisions of Clause 4.

32. Employer's Right to Accept any Bid and to Reject any or all Bids

32.1 Notwithstanding Clause 31, the Employer reserves the right to accept or reject any Bid, and to cancel the Bidding process and reject all Bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Employer's action.

33. Notification of Award and Signing of Agreement

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

33.2 The notification of award will constitute the formation of the Contract, subject only to the furnishing of a performance security in accordance with the provisions of Clause 34.

33.3 The Agreement will incorporate all agreements between the Employer and the successful Bidder. It will be signed by the Employer and sent to the successful Bidder, or kept ready for signature of the successful bidder in the office of employer (***choose one alternative***) within 28 days following the

notification of award along with the Letter of Acceptance. Within 21 days of receipt, the successful Bidder will sign the Agreement and deliver it to the Employer.

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

34. Performance Security

34.1 Within 21 days of receipt of the Letter of Acceptance, the successful Bidder shall deliver to the Employer a Performance Security in any of the forms given below for an amount equivalent to **2%** of the Contract price plus additional security for unbalanced Bids in accordance with Clause 30 of ITB and Clause 52 of Conditions of Contract:

The Performance security shall be drawn in favour of "The Commissioner, Corporation of Chennai" and may be in one of the following forms:

- Irrevocable bank guarantee in a prescribed format issued by a nationalized / scheduled bank located in India or a reputed bank located abroad in the form given in Section 8; for **the whole period of contract + Defects liability period + 28 days or**

- Bank draft from Nationalized Bank/ scheduled bank in favour of "The Commissioner, Corporation of Chennai" payable at Chennai

34.2 If the performance security is provided by the successful Bidder in the form of a Bank Guarantee, it shall be issued either (a) at the Bidder's option, by a Nationalized/Scheduled Indian bank or (b) by a foreign bank located in India and acceptable to the Employer or (c) by a foreign bank through a correspondent Bank in India [scheduled or nationalized].
'The performance security of a Joint Venture shall be in the name of the joint venture.

34.3 Failure of the successful bidder to comply with the requirements of sub-clause 34.1 shall constitute a breach of contract, cause for annulment of the award, forfeiture of the bid security, and any such other remedy the Employer may take under the contract, and the Employer may resort to awarding the contract to the next ranked bidder.

35 Advance Payment and Security

35.1 The Employer will provide an Advance Payment on the Contract Price as stipulated in the Conditions of Contract, subject to maximum amount, as stated in the Contract Data.
The Employer shall make mobilization advance payment to the Contractor an amount of 5% of the contract price, against provision by the Contractor of irrevocable Bank Guarantee in a form and by a bank acceptable to the Employer in amounts and currencies equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the contractor. Interest will be charged at an interest rate 14.5% on the advance payment.

The Contractor is to use the advance payment only to pay for Equipment, Plant and Mobilisation expenses required specifically for execution of the works. The contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Engineer.

The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done.

36. Adjudicator

36.1 The Employer proposes that Th.V.Dinakaran M.E., Retd. Chief Engineer Tamilnadu State P.W.D be appointed as Adjudicator under the Contract, at a **daily fee of *Rs.5000/-per sitting on day basis*.** If the Bidder disagrees with this proposal, the Bidder should so state in the Bid. If in the Letter of Acceptance, the Employer has not agreed on the appointment of the Adjudicator, the Adjudicator shall be appointed by Institution of Engineers (India) Tamil Nadu Chapter, at the request of either party.

Signature of the Tenderer

37. Corrupt or Fraudulent Practices

37.1 The Employer expects the Bidders/Suppliers/Contractors, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, Corporation of Chennai.

(a) defines, for the purposes of this provision, the terms set forth below as follows :

(i) "corrupt practice" means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution; and

(ii) "fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.

(b) will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

(c) will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing contract.

37.2 Further more, Bidders shall be aware of the provision stated in sub-clause 59.2 of the Conditions of Contract.

Signature of the Tenderer

SECTION 2:
FORMS OF BID, QUALIFICATION INFORMATION AND LETTER OF ACCEPTANCE

Table of Forms:

- **CONTRACTOR'S BID**
- **QUALIFICATION INFORMATION**
- **LETTER OF ACCEPTANCE**
- **NOTICE TO PROCEED WITH THE WORK**
- **AGREEMENT FORM**

Contractor's Bid

Description of the Works:
Construction of storm water drain works in Adyar Water Shed in Chennai city. .

Bid No.3367

To: ***The Commissioner***
Address*:* ***Corporation of Chennai,***
Ripon Buildings,
Chennai– 600 003.
Tel.: +91-44-25619316
Tele Fax + 91- 44- 25383962.
www.chennaicorporation.gov.in

GENTLEMEN,

Having examined the bidding documents including addendum, we offer to execute the Works described above in accordance with the Conditions of Contract, Specifications, Drawings and Bill of Quantities accompanying this Bid for the Contract Price of _____ *[in figures]*
*(*_____) *[in letters]*[1].

The advance Payment required is: Rupees _____.

We accept the appointment of _____ as the Adjudicator.

(OR)

We do not accept the appointment of _____ as the Adjudicator and propose instead that _____ be appointed as Adjudicator whose daily fees and biographical data are attached.

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

We undertake that, in competing for (and, if the award is made to us, in executing) the above contract, we will strictly observe the laws against fraud and corruption in force in India namely “Prevention of Corruption Act 1988”.

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

Name and address of agent	Amount	Purpose of Commission or gratuity
_____	_____	_____
_____	_____	_____
_____	_____	_____

(if none, state “none”)

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

Yours faithfully,

Authorized Signature:

Name & Title of Signatory: _____

Name of Bidder : _____

Address :

[1] To be filled in by the Bidder, together with his particulars and date of submission at the bottom of the Form of Bid.

Qualification Information

The information to be filled in by the Bidder in the following pages will be used for purposes of post qualification as provided for in Clause 4 of the Instructions to Bidders. This information will not be incorporated in the Contract.

1. **For Individual Bidders**

1.1 Constitution or legal status of Bidder
[Attach copy]

Place of registration: _____

Principal place of business: _____

Power of attorney of signatory of Bid
[Attach]

1.2 Total value of Civil Engineering construction work executed and payments received in the last five years (in Rs. Lakh) β

2005-2006_____
2006-2007_____
2007-2008_____
2008-2009_____
2009-2010_____

1.3.1 Work performed as prime contractor (in the same name) on works of a similar nature over the last five years from 2005 -2006 to 2009- 2010.

Project Name	Name Of the Employer*	Description of work	Contract No.	Value of contract (Rs. Million)	Date of issue of work order	Stipulated period of completion	Actual date of completion *	Remarks explaining reasons for delay and work completed

1.3.2 Quantities of work executed as prime contractor (in the same name and style) in the last five years from 2005 – 2006 to 2009 – 2010.

Year	Name of the work	Name of the Employer *	Quantity of work performed		Remarks *β (indicate contract Ref)
			PCC	RCC	
2005– 2006					
2006 – 2007					
2007 – 2008					
2008 – 2009					
2009 – 2010					

*****Attach certificate(s) from the Engineer(s)-in-Charge*
β Attach certificate from Chartered Accountant.

Signature of the Tenderer

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

(A) Existing commitments and on-going works:

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

(B) Works for which bids already submitted:

Description of Work (1)	Place & State (2)	Name and Address of Employer (3)	Estimated value of works (Rs. Million) (4)	Stipulated period of completion (5)	Date when decision is expected (6)	Remarks if any (7)

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

1.5 The following items of Contractor's Equipment are essential for carrying out the Works. The Bidder should list all the information requested below. Refer also to Sub Clause 4.3 (d) of the Instructions to Bidders.

Item of Equipment	Requirement No.	Owned/leased/ to be procured	Availability proposals Nos./ capacity	Availability proposals Age/ condition	Remarks (From whom to be purchased)
Equipments & Machineries					
(i) Dumpy level	5 Nos.				
Total station	2 Nos				
Concrete mixer machine	10 Nos.				
Needle vibrator with 40 mm needle	15 Nos.				
Centring & shuttering material in steel	As required				
JCB	4 Nos				
Poclain	1 No				
Float	1 No				
Tipper Lorry	10 Nos				
Hydrostatic testing machine	3 Nos				
Dewatering Pump (25 HP)	7 Nos				
Dewatering Pump (15 HP)	8 Nos				
(ii) Concrete batching Plant (Capacity 25m^3 to 40 m^3 per Hour)	1 No				
Transit Mixer	12 Nos				

1.6 In respect of Qualifications and experience of key personnel proposed for administration and execution of the Contract, biographical data should be attached. Refer also to Sub Clause 4.3 (e) and 4.5 (B) (b) of instructions to Bidders and Sub Clause 9.1 of the Conditions of Contract.

Position	Name	Qualifications	Years of experience (general)
One Project Manager		BE(Civil)	15
One Drainage Engineer		BE(Civil)	10
One Structural Engineer		BE(Civil)	10
Two Site Engineers		Diploma(civil)	10
One Testing personnel		B.Sc.,(Chemistry)	3

Signature of the Tenderer

The above Key personnel are minimum requirement. Further it is required that the bidder should have subordinate technical staff such as CIVIL/Mechanical Supervisors and field engineers, lab assistants/scientists, data entry operator programmers and other clerical support staff.

1.7 Proposed subcontracts and firms involved. [Refer ITB Clause 4.3 (j)]

Sections of the works	Value of Sub-contract	Sub-contractor (name and address)	Experience in similar work
*	*	*	*
	*	*	
*	*	*	*
	*	*	
*	*	*	*
	*	*	

1.8 Financial reports for the last five years: balance sheets, profit and loss statements, auditors' reports (in case of companies/corporation), etc. List them below and attach copies.

1.9 Evidence of access to financial resources to meet the qualification requirements: cash in hand, lines of credit, etc. List them below and attach copies of support documents *[sample format attached]*.

1.10. Name, address, and telephone, telex, and fax numbers of the Bidders' bankers who may provide references if contacted by the Employer.

1.11 Information on litigation history in which the Bidder is involved.

Other party(ies)	Employer	Cause of dispute	Amount involved	Remarks showing Present status

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

1.13 Proposed work method and schedule. The Bidder should attach descriptions, drawings and charts as necessary to comply with the requirements of the Bidding documents. [Refer ITB Clause 4.1 and 4.3 (j)].

2. Joint venture has maximum of three members only. Any one of the member should be registered as a Legal Entity in India for a minimum period of 5(Five) Years. Any one of the member should be well established and reputed Civil Engineering Construction and carried out works in the last five years. Lead member should have a minimum of 51% of the share. However before entering into the agreement they should form special purpose vehicle.

2.1 The information listed in 1.1-1.12 above shall be provided for each partner of the joint venture.

2.2 The information in 1.13 above shall be provided for the joint venture.

2.3 Attach the power of attorney of the signatory[ies] of the bid authorizing signature of the bid on behalf of the joint venture..

2.4 Attach the agreement among all partners of the joint venture [and which is legally binding on all partners], which shows the requirements as indicated in sub-clause 4.4 of the Instructions to Bidders'. Alternatively, a Letter of Intent to execute a Joint Venture Agreement in the event of a successful bid shall be signed by all partners and submitted with the bid, together with a copy of the proposed Agreement

2.5 Furnish details of participation proposed in the joint venture as below:

3. Additional Requirements

3.1 Bidders should provide any additional information required to fulfil the requirements of Clause 4 of the Instructions to the Bidders, if applicable.

Signature of the Tenderer

SAMPLE FORMAT FOR EVIDENCE OF ACCESS TO OR AVAILABILITY OF CREDIT FACILITIES –*
CLAUSE 4.5 [B] [c] OF ITB

BANK CERTIFICATE

This is to certify that M/s. …… is a reputed company with a good financial standing.

If the contract for the work, namely ……. (Name of work) is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. …… to meet their working capital requirements for executing the above contract.

__ Sd. __
Name of Bank
Senior Bank Manager
Address of the Bank

*** Change the text as follows for Joint venture:**

This is to certify that M/s. …… who has formed a JV with M/s. …… and M/s. ……. for participating in this bid, is a reputed company with a good financial standing.

If the contract for the work, namely ……. is awarded to the above Joint Venture, we shall be able to provide overdraft/credit facilities to the extent of Rs. …… to M/s. ……. to meet the working capital requirements for executing the above contract.

[This should be given by the JV members in proportion to their financial participation.]

Signature of the Tenderer

Letter of Acceptance

(letterhead paper of the Employer)

_____[date]

To: _____[name and address of the Contractor]

Dear Sirs,

This is to notify you that your Bid dated ---------- for execution of the _____

_____ [name of the contract and identification number, as given in the Instructions to Bidders] for the Contract Price of Rupees _____ _____ (_____) [amount in words and figures], as corrected and modified in accordance with the Instructions to Bidders[1] is hereby accepted by our Agency.

We accept/do not accept that _____ be appointed as the Adjudicator.

We note that as per bid, you do not intend to subcontract any component of work.

[OR]

We note that as per bid, you propose to employ M/s. ..... as sub-contractor for executing ….....

You are hereby requested to furnish Performance Security, plus additional security for unbalanced bids in terms of ITB clause 30, in the form detailed in Para 34.1 of ITB for an amount of Rs.————— within 21 days of the receipt of this letter of acceptance. The Performance Security shall be valid until a date 28 days from the date of expiry of Defects Liability Period and the additional security for unbalanced bids shall be valid until a date 28 days from the date of issue of the certificate of completion.

We have reviewed the construction methodology submitted by you along with the bid in response to ITB Clause 4.3[k] and our comments are given in the attachment. You are requested to submit a revised Program including environmental management plan as per Clause 27 of General Conditions of Contract within 14 days of receipt of this letter.

Yours faithfully,

Authorized Signature

Name and Title of Signatory

Name of Agency

---

1 Delete "corrected and" or "and modified" if only one of these actions applies. Delete "as corrected and modified in accordance with the Instructions to Bidders" if corrections or modifications have not been effected.

2 To be used only if the Contractor disagrees in his Bid with the Adjudicator proposed by the Employer in the "Instructions to Bidders."

Issue of Notice to proceed with the work

(letterhead of the Employer)

———— (Date)

To

——————————— (Name and Address of the Contractor)

———————————

———————————

Dear Sirs:

Pursuant to your furnishing the requisite security as stipulated in ITB clause 34.1 and signing of the contract agreement for the construction of ———————— @ a Bid Price of Rs.————————, you are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Yours faithfully,

(Signature, name and title of signatory authorized to sign on behalf of Employer)

Agreement Form

Agreement

This agreement, made the _____ day of _____19_____, between_____

_____[name and address of Employer]

(hereinafter called "the Employer)" of the one part and

_____

_____

_____[name and address of contractor]

(hereinafter called "the Contractor") of the other part.

Whereas the Employer is desirous that the Contractor execute _____

_____

_____

[name and identification number of Contract] (hereinafter called "the Works") and the Employer has accepted the Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein, at a contract price of Rs.....

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.

2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all aspects with the provisions of the Contract.

3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying the defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

4. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:

   i) Letter of Acceptance;
   ii) Notice to proceed with the works;
   iii) Contractor's Bid;
   iv) Contract Data;
   v) Conditions of contract (including Special Conditions of Contract);
   vi) Specifications;
   vii) Drawings& locations;
   viii) Bill of Quantities;
   ix) Pre qualification
   x) Any other document listed in the Contract Data as forming part of the contract.
   x) Joint Venture Agreement.

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

The Common Seal of

_____

was hereunto affixed in the presence of:

Signed, Sealed and Delivered by the said

_____

in the presence of:

Binding Signature of Employer _____ _

Binding Signature of Contractor _____

SECTION 3: CONDITIONS OF CONTRACT

Conditions of Contract

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Conditions of Contract

A. General

1. Definitions

1.1 Terms which are defined in the Contract Data are not also defined in the Conditions of Contract but keep their defined meanings. Capital initials are used to identify defined terms.

The **Adjudicator** is the person appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in Clauses 24 and 25. The name of the Adjudicator is defined in the Contract Data.

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

Compensation Events are those defined in Clause 44 hereunder.

The **Completion Date** is the date of completion of the Works as certified by the Engineer in accordance with Sub Clause 55.1.

The **Contract** is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.3 below Conditions of Contract (CC), the Special Conditions (SC).

The **Contract Data** defines the documents and other information which comprise the Contract.

The **Contractor** is a person or corporate body whose Bid to carry out the Works has been accepted by the Employer.

The **Contractor's Bid** is the completed Bidding document submitted by the Contractor to the Employer.

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

Days are calendar days; **months** are calendar months.

A **Defect** is any part of the Works not completed in accordance with the Contract.

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

The **Commissioner** is Commissioner, Corporation of Chennai.

The **Employer** is the party who will employ the Contractor to carry out the Works. In this case Commissioner, Corporation of Chennai is the Employer.

The **Engineer** is the person named in the Contract Data (or any other competent person appointed and notified to the contractor to act in replacement of the Engineer) who is responsible for supervising the execution of the works and administering the Contract.

QAQC Service provider's Technical Personnel means Quality Assurance and Quality Control Technical Personnel authorised by the Employer.

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

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

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

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

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

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

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

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

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

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

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

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

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

2. Interpretation

2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Engineer will provide instructions clarifying queries about the Conditions of Contract.

2.2 If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion date for the whole of the Works).

2.3 The documents forming the Contract shall be interpreted in the following order of priority:

(1) Agreement

(2) Letter of Acceptance, notice to proceed with the works

(3) Contractor's Bid

(4) Contract Data

(5) Conditions of Contract including Special Conditions of Contract

(6) Specifications

(7) Drawings

(8) **Bill of Quantities** and

(9) any other document listed in the Contract Data as forming part of the Contract

.

(10) Joint Venture agreement

3. Language and Law

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

4. Engineer's Decisions

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

5. Delegation

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

6. Communications

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

7. Subcontracting

7.1 If the prime contractor desires to sub-let a part of the work, he should submit the same at the time of filing tenders itself or during execution, giving the name of the proposed Sub-contractor, along with details of his qualification and experience. The Tender Accepting Authority should verify the experience of the Sub-contractor and if the Sub-contractor satisfies the qualification criteria in proportion to the value of work proposed to be sub-let, he may permit the same. The total value of works to be awarded on sub-letting shall not exceed 50% of contract value. The extent of subletting shall be added to the experience of the sub-contractor and to that extent deducted from that of the main contractor.

The Contractor may subcontract with the approval of the Engineer but may not assign the Contract without the approval of the Employer in writing. Subcontracting does not alter the Contractor's obligations.

7.2 The contractor shall not be required to obtain any consent from the employer for:

a) the sub-contracting of any part of the Works for which the Sub-contractor is named in the contract;
b) the provision of labour; and
c) the purchase of materials which are in accordance with the standards specified in the Contract.

Beyond this if the contractor proposes sub-contracting any part of the work during execution of works, because of some unforeseen circumstances to enable him to complete the work as per terms of the contract, the Engineer will consider the following before according approval:

- The contractor shall not sub-contract the whole of the Works.

- The contractor shall not sub-contract any part of the Work without prior consent of the Engineer. Any such consent shall not relieve the contractor from any liability or obligations under the contract and he shall be responsible for the acts, defaults and neglects of any sub-contractor, his agents or workmen as fully as if they were the acts, defaults or neglects of the contractor, his agents or workmen.

- The Engineer should satisfy whether (a) the circumstances warrant such sub-contracting; and (b) the sub-contractors so proposed for the Work possess the experience, qualifications and equipment necessary for the job proposed to be entrusted to them in proportion to the quantum of work to be sub-contracted.

(Note: 1. All bidders are expected to indicate clearly in the bid, if they proposed sub-contracting elements of the works amounting to more than 20 percent of the Bid Price. For each such proposal the qualification and the experience of the identified sub-contractor in the relevant field should be furnished along with the bid to enable the employer to satisfy himself about their qualifications before agreeing for such sub-contracting and include it in the contract. In view of the above, normally no additional sub-contracting should arise during execution of the contract.

2. However, [a] sub contracting for certain specialized elements of the work is not unusual and acceptable for carrying out the works more effectively; but vertical splitting of the works for subcontracting is not acceptable. [b] In any case, proposal for sub-contracting in addition to what was specified in bid and stated in contract agreement will not be acceptable if the value of such additional sub-contracting exceeds 25% of value of work which was to be executed by Contractor without sub-contracting.

3. Assignment of the contract may be acceptable only under these three circumstances
(a) Insolvencies (b) Liquidation (c) merger of companies

8. Other Contractors

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

9. Key Personnel

9.1 The Contractor shall employ the key personnel specified here under to carry out the functions stated in the Schedule or other personnel approved by the Engineer. The Engineer will approve any proposed replacement of key personnel only if their qualifications, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the Schedule.

Position	Name	Qualifications (general)	experience
One Project Manager		BE(Civil)	15
One Drainage Engineer		BE(Civil)	10
One Structural Engineer		BE(Civil)	10
Two Site Engineers		Diploma(civil)	10
One Testing personnel		B.Sc (Chemistry)	3

9.2 If the Engineer asks the Contractor to remove a person who is a member of the Contractor's staff or his work force stating the reasons the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

9.3 Failure to employ the referred key technical personnel in the Clause 1.6 of Section 2 by the contractor, the following penalty amount will be recovered from the contractor over and above the provision made from the contractor's bill as below.

Position	**Penalty Amount per Month per person**
One Project manager	Rs.10000/-
One Drainage Engineer	Rs.7000/-
One Structural Engineer	Rs.7000/-
Two site Engineers	Rs.5000/-
One Testing Personal	Rs.5000/-

In the event of non availability more than 75% of key Technical Personnel at a given time it will attracts breach of contract and Termination notice will be served.

9.4 The technical personnel should be on full time basis and available at site whenever required by Engineer in Charge to take instructions.

9.5 The names of the technical personnel to be employed by the contractor should be furnished in the statement enclosed separately.

9.6 In case the contractor is already having more than one work on hand and has undertaken more than one work at the same time, he should employ separate technical personnel for each work as stipulated as per clause 1.6 of Section -2.

9.7 If the contractor fails to employ technical personnel the work will be suspended or department will engage technical personnel and will recover the cost thereof from the contractor.

10. Employer's and Contractor's Risks

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

11. Employer's Risks

11.1 The Employer is responsible for the excepted risks which are (a) in so far as they directly affect the execution of the Works in the Employer's country, the risks of war, hostilities, invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, riot commotion or disorder (unless restricted to the Contractor's employees), and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive, or (b) a cause due solely to the design of the Works, other than the Contractor's design.

12. Contractor's Risks

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

13. Insurance

13.1 The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the Contract Data for the following events which are due to the Contractor's risks:

(a) loss of or damage to the Works, Plant and Materials;

(b) loss of or damage to Equipment;

(c) loss of or damage of property (except the Works, Plant, Materials and Equipment) in connection with the Contract; and

(d) personal injury or death.

13.2 Policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

13.3 If the Contractor does not provide any of the policies and certificates required, the Employer may effect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.

13.4 Alterations to the terms of an insurance shall not be made without the approval of the Engineer.

13.5 Both parties shall comply with any conditions of the insurance policies.

14. Site Investigation Reports

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

15. Queries about the Contract Data

15.1 The Engineer will clarify queries on the Contract Data.

16. Contractor to Construct the Works

16.1 The Contractor shall construct and install the Works in accordance with the Specification and Drawings, and as per instructions of Engineer.

17. The Works to Be Completed by the Intended Completion Date

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

18. Approval by the Engineer

18.1 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Engineer, who is to approve them if they comply with the Specifications and Drawings.

18.2 The Contractor shall be responsible for design of Temporary Works.

18.3 The Engineer's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

18.4 The Contractor shall obtain approval of third parties to the design of the Temporary Works where required.

18.5 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Engineer before their use.

19. Safety

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

19.2 Temporary Diversions

The contractor shall at all times carryout work on the highway in a manner creating least interference to the flow of traffic while consistent with the satisfactory execution of the same.

19.3 The contractor shall take all necessary measures for the safety of traffic during construction and provide erect and maintain such barricades, including signs, markings, flags lights and information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up any construction, an agreed phased

programme for the diversion of traffic on the highway shall be drawn up in consultation with the Engineer-in-charge.

19.4 The barricades erected on either side of the carriage way portion of the carriage way closed to traffic, shall be of strong design to resist violation and painted with alternative black and white stripe. Red lanterns or warnings lights of similar type shall be mounted on the barricades at night and kept lit throughout from sunset to sunrise.

19.5 Ramps:

Ramps required during execution may be formed wherever necessary and same are to be removed after completion of the work. No separate payment will be made for this purpose.

19.6 Monsoon Damages:

Damages due to rain or flood either in cutting or in banks shall have to be made good by the contractor till the work is handed over to the Department. The responsibility of de-silting and making good the damages due to rain or flood rests with the contractor. No extra payment is payable for such operations and the contractor shall therefore, have to take all necessary precautions to protect the work done during the construction period.

20. Discoveries

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

21. Possession of the Site

21.1 The Employer shall give possession of part of the site mentioned in the current milestone. If possession of a part is not given by the date, Contractor is eligible for extension of time for the corresponding period.

22. Access to the Site

22.1 The Contractor shall allow the Engineer and any person authorized by the Engineer/third party Quality control Technical Personnel access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured / fabricated / assembled for the works.
The QAQC personnel should be permitted to perform the quality and quantity check in connection with the contract.

23. Instructions

23.1 The Contractor shall carry out all instructions of the Engineer which comply with the applicable laws where the Site is located.

24. Disputes

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

25. Procedure for Disputes

25.1 The Adjudicator shall give a decision in writing within 28 days of receipt of a notification of a dispute.

25.2 The Adjudicator shall be paid daily at the rate specified in the Contract Data together with reimbursable expenses of the types specified in the Contract Data and the cost shall be divided equally between the Employer and the Contractor, whatever decision is reached by the Adjudicator. Either party may refer a decision of the Adjudicator to an Arbitrator within 28 days of the Adjudicator's written decision. If neither party refers the dispute to arbitration within the above 28 days, the Adjudicator's decision will be final and binding.

25.3 The arbitration shall be conducted in accordance with the arbitration procedure stated in the Special Conditions of Contract.

26. Replacement of Adjudicator

26.1 Should the Adjudicator resign or die, or should the Employer and the Contractor agree that the Adjudicator is not fulfilling his functions in accordance with the provisions of the Contract, a new Adjudicator will be jointly appointed by the Employer and the Contractor. In case of disagreement between the Employer and the Contractor, within 30 days, the Adjudicator shall

be designated by the Appointing Authority designated in the Contract Data at the request of either party, within 14 days of receipt of such request.

B. Time Control

27. Program

27.1 Within the time stated in the Contract Data the Contractor shall submit to the Engineer for approval a Program including Environmental Management Plan showing the general methods, arrangements, order, and timing for all the activities in the Works along with monthly cash flow forecast.

27.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.

27.3 The Contractor shall submit to the Engineer, for approval, an updated Program at intervals no longer than the period stated in the Contract Data. If the Contractor does not submit an updated Program within this period, the Engineer may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted.

27.4 The Engineer's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Engineer again at any time. A revised Program is to show the effect of Variations and Compensation Events.

28. Extension of the Intended Completion Date

28.1 The Engineer shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work and which would cause the Contractor to incur additional cost.

28.2 The Engineer shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Engineer for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

29. Deleted

30. Delays Ordered by the Engineer

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

31. Management Meetings

31.1 Either the Engineer or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

31.2 The Engineer shall record the business of management meetings and is to provide copies of his record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken is to be decided by the Engineer either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

32. Early Warning

32.1 The Contractor is to warn the Engineer at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price or delay the execution of works. The Engineer may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate is to be provided by the Contractor as soon as reasonably possible.

32.2 The Contractor shall cooperate with the Engineer in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Engineer.

C. Quality Control

33. Identifying Defects

In order to ensure good quality of work Corporation of Chennai intends to engage third party Quality assurance and Quality control consultants for supervising the construction works and to conduct the quality check . The contractor should co-operate with QAQC personnel and to permit them to carryout their duties.

33.1 The Engineer/QAQC technical personnel appointed by Corporation of Chennai shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Engineer may instruct the Contractor to assess the defects and to uncover and test any work that the Engineer considers may have a Defect.

33.2 The contractor shall permit the Employer's QAQC personnel or Technical auditor to check the contractor's work and notify the Engineer and Contractor of any defects that are found. Such a check shall not affect the Contractor's or the Engineer's responsibility as defined in the Contract Agreement.

33.3 In addition to the normal inspection by the regular Corporation of Chennai staff in charge of the Construction of work, and by the QAQC personnel authorised by the Chennai Corporation to check the quality of the work it will also be inspected by the Executive Engineer/ Superintending Engineer Quality control Circle or by the State or District level Vigilance Cell Unit and any other authorised external Agency. If any sub-standard work or excess payments are noticed with reference to measurement books etc., during such inspection action will be taken based on their observations and these will be effected by the Engineer-in-Charge of the execution of the work.

For all works costing more than Rs.2.00 Crores the Contractor shall submit quality plan and also show proof of owning quality lab or tie-up with an established quality lab.

34. Tests

By Contractor – All tests and number of tests as specified in the relevant codes to be carried out by the contractor in his lab in the presence of Engineer in charge / QAQC technical personnel appointed by Corporation of Chennai.

By QAQC – In addition to the tests carried at the Contractor's lab further 10% tests as specified in the relevant codes should be carried by QAQC.The contractor should permit the QAQC Personnel to take samples for quality check.

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

IS Codes for Materials

The following are the some of the related IS codes for Quality Assurance Tests.

Item name	Name of the tests to be Conducted	IS. Code No according to which the tests are to be conducted
Soil test for Foundation	51 Bearing capacity of soil	IS: 2720 part 16 – 1963
Sand(Fine aggregate)	particle size & shape	IS: 2386 part I – 1963
	silt content	IS: 2386 part II – 1963
	Fineness Modulus	IS: 2386 part I – 1963
Coarse aggregate	1.Particle Size & shape a) Size and grading of aggregates b) Flakiness Index c) Elongation Index	IS: 2386 part I – 1963
	2. Aggregate Crushing Value	IS: 2386 part IV – 1963
	3.Aggregate Impact value	IS: 2386 part IV – 1963
	4. Aggregate Abrasion	IS: 2386 part IV – 1963
Cement Concrete	1. Compressive strength	IS: 516-1959

Cement	1. Consistency of standard cement Paste.	IS: 4031(part IV) 1988
	1. Setting time a) initial b) Final	IS: 269-1976
	2. Soundness by Le Chatelier Expansion	IS: 269-1976
	3. Compressive strength A. 33 grade	IS: 269-1976
	B. 43 grade	IS :8112-1989
	C. 53 grade	IS :12269-1987
	5. specific gravity of cement	
Steel	1. Elongation	IS :1786-2008
	2.Percent proof stress	IS :1786-2008
	3.Tensile Strength	IS :1786-2008

FREQUENCY OF SAMPLING OF TEST AT SITE

Material	Quantity	No. of Samples for testing
Steel	Every lot	1
Concrete	1-5 m^3	1
	6-15 m^3	2
	16-30 m^3	3
	31-50 m^3	4
	51 and above	4 plus one additional sample for each additional 50 m^3 or part (3 cubes per sample)
Sand and Aggregate		As and when materials brought to site
Cement	Every consignment	1

35. Correction of Defects

35.1 The Engineer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

35.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Engineer's notice.

36. Uncorrected Defects

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

Note: Where in certain cases, the technical specifications provide for acceptance of works within specified tolerance limits at reduced rates, Engineer will certify payments to Contractor accordingly.

D. Cost Control

37. Bill of Quantities

37.1 The Bill of Quantities shall contain items for the construction, installation, testing, and commissioning work to be done by the contractor.

37.2 The Bill of Quantities is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item.

38. Changes in the Quantities

38.1 If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 1% of Initial Contract Price, the Engineer shall adjust the rate to allow for the change.

38.2 The Engineer shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent, except with the Prior approval of the Employer.

38.3 If requested by the Engineer, the Contractor shall provide the Engineer with a detailed cost breakdown of any rate in the Bill of Quantities.

39. Variations

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

40. Payments for Variations

40.1 The Contractor shall provide the Engineer with a quotation (with breakdown of unit rates) for carrying out the Variation when requested to do so by the Engineer. The Engineer shall assess the quotation, which shall be given within seven days of the request or within any longer period stated by the Engineer and before the Variation is ordered.

40.2 If the work in the Variation corresponds with an item description in the Bill of Quantities and if, in the opinion of the Engineer, the quantity of work above the limit stated in Sub Clause 38.1 or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in form of new rates for the relevant items of work.

40.3 If the Contractor's quotation is unreasonable (or if the contractor fails to provide the Engineer with a quotation within a reasonable time specified by the engineer in accordance with Clause 40.1), the Engineer may order the Variation and make a change to the Contract Price which shall be based on Engineer’s own forecast of the effects of the Variation on the Contractor's costs.

40.4 If the Engineer decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

40.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

41. Cash flow forecasts

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

42. Payment Certificates

42.1 Payment of bills will be entertained only after the receipt of Certificates for Quality and Quantity check from the Quality Assurance and Quality Control personnel authorised by Corporation of Chennai.

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

42.3 The Engineer shall check the Contractor's monthly statement and within 14 days there of certify the amount to be paid to the Contractor after taking into account any credit or debit for the month in question in respect of materials for the works in the relevant amounts and under conditions set forth in sub-clause 51(3) of the Contract Data (Secured Advance).

42.4 The value of work executed shall be determined by the Engineer.

42.5 The value of work executed shall comprise the value of the quantities of the items in the Bill of Quantities completed..

42.6 The value of work executed shall include the valuation of Variations and Compensation Events.

42.7 The Engineer may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

43. Payments

43.1 Payment for the work done by the contractor will be made for the finished work based on the measurements recorded in measurement books by any officer of the department not lower in rank than a Assistant Engineer/ Junior Engineer and check measured by any officer not lower in rank than a Executive Engineer. The measurement shall be recorded at various stages of the work done and also after work is completed. The contractor shall be present at the time of recording of each set of measurement and their check measurement and accept them then and there so as to avoid disputes at a later stage. If the contractor is not available at the work spot at the time of recording measurements or check measurements the particulars of measurements shall be signed by the authorised agent of contractor based on which the contractor shall accept the set of measurements without any further dispute. If for any reason the contractor's authorised agent is also not available at site when the department decides to suspend the work recording of measurements in the absence of the contractor or his authorised representative the department shall not entertain any claim from the contractor for any loss incurred by him on this account. The Contractor shall however note that the Department cannot indefinitely wait for recording the measurement due to the absence of the Contractor and his authorised agent and check measure them even in the absence of the contractor.

43.2 Unless otherwise directed, measurements shall not be taken until sufficient materials for use on work have been collected and stacked. Immediately after measurement, the stack shall be marked by white wash or other means as directed by the Engineer-in-charge.

43.3 Payments shall be adjusted for deductions for advance payments, retention, other recoveries in terms of the contract and taxes, at source, as applicable under the law. The Employer shall pay the Contractor the amounts certified by the Engineer within 28 days of the date of each certificate.

43.4 In case of over payments or wrong payment if any made to the contractor due to wrong interpretation of the provisions of the contract, APSS or Contract conditions etc., such unauthorised payment will be deducted in the subsequent bills or final bill for the work or from the bills under any other contracts with the Government or at any time there after from the deposits available with the Government.

43.5 Any recovery or recoveries advised by the Government Department either state or central, due to non-fulfilment of any contract entered into with them by the contractor shall be recovered from any bill or deposits of the contractor.

43.6 No claim shall be entertained, if the same is not represented in writing to the Engineer-in-Charge within 15 days of its occurrence.

43.7 The contractor is not eligible for any compensation for inevitable delay in handing over the site or for any other reason. In such case, suitable extensions of time will be granted after considering the merits of the case.

43.8 If an amount certified is increased in a later certificate or as a result of an award by the Adjudicator/ Arbitrator the Contractor shall be paid as per the verdict of the Adjudicator/ Arbitrator.

43.9 Items of the Works for which no rate or price has been entered in will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

43.10 Unfixed Materials:

No payment or advance will be made for unfixed materials when the rates are for finished work "in situ".'

44. Compensation Events

44.1 The following are Compensation Events unless they are caused by the Contractor:

(a) The Employer does not give access to a part of the Site mentioned in the current milestone.

(b) The Employer modifies the schedule of other contractors in a way which affects the work of the contractor under the contract.

(c) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of Letter of Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.

(d) The Engineer gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.

(e) Other contractors, public authorities, utilities or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.

(f) The advance payment is delayed.

(g) The effect on the Contractor of any of the Employer's Risks.

(h) Other Compensation Events listed in the Contract Data or mentioned in the Contract.

44.2 If a Compensation Event would prevent the work being completed before the intended completion date, the intended completion date is extended. The Engineer shall decide by how much the intended completion date shall be extended.

44.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast, it is to be assessed by the Engineer. If the Contractor's forecast is deemed unreasonable, the decision of the Engineer is final binding on the contractor. The Engineer will assume that the Contractor will react competently and promptly to the event.

44.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor not having given early warning or not having cooperated with the Engineer.

45. Tax

45.1 The rates quoted by the Contractor shall be deemed to be inclusive of the sales and other taxes that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at source as per applicable law.

46. Currencies

46.1 All payments shall be made in Indian Rupees.

47. Price Adjustment

Contract price shall be adjusted for increase or decrease in rates and price of labour, equipments, materials and, fuel in accordance with the following principles and procedures and as per formula given below.

(a) The price adjustment shall apply for the work done from the start date given in the contract data up to end of the initial intended completion date or extensions granted by the Engineer shall not apply to the work carried out beyond the stipulated time for reasons attributable to the contractor.

(b) The price adjustment shall be determined during each quarter from the formula given in the contract data.

(c) Following expressions and meanings are assigned to the work done during each quarter.

R = Total value of work done during the quarter. It would include the value of materials on which secured advance has been granted, if any, during the quarter, less the value of materials in respect of which the secured advance has been recovered, if any during the quarter. It will exclude value for works executed under variations for which price adjustment will be worked separately based on the terms mutually agreed.

To the extent that full compensation for any rise or fall in costs to the contractor is not covered by the provisions of this or other clauses in the contract, the unit rates and prices included in the contract shall be deemed to include amounts to cover the contingency of such other rise or fall in costs.

PRICE ADJUSTMENT

Adjustment for Labour component:

$V_L = 0.85 \times P_l / 100 \times R \times (L_1 - L_0) / L_0$

V_L = Increase or decrease in the cost of work during the quarter under consideration due to changes in rates for local labour.

L_0 = The average consumer price index for industrial workers for Chennai centre for the quarter preceding the date of opening of bids as published by Labour Bureau, Ministry of Labour, Government of India.

L_1 = The average consumer price index for industrial workers for Chennai centre for the quarter under consideration as published by Labour Bureau, Ministry of Labour, Government of India.

P_l = Percentage of Labour component of work calculated based on Corporation data

R = Total value of work done during the quarter excluding cost of materials and electrical energy supplied by the Employer at fixed prices. It would include the value of materials on which secured advance has been granted, if any, during the quarter, less the value of materials in respect of which the secured advance has been recovered, if any during the quarter.

Adjustment for Cement component:

$V_C = 0.85 \text{ X} P_C / 100 \text{ X R X } (C_1 - C_0) / C_0$

V_C = Increase or decrease in the cost of work during the quarter under consideration due to changes in rates for Cement.

C_0 = The all India average wholesale price index for Cement for the quarter preceding the date of opening of bids as published by the Ministry of Industrial Development, Government of India, New Delhi.

C_1 = The all India average wholesale price index for Cement for the quarter under consideration as published by the Ministry of Industrial Development, Government of India, New Delhi.

P_C = Percentage of Cement component of work calculated based on Corporation data

R = Total value of work done during the quarter excluding cost of materials and electrical energy supplied by the Employer at fixed prices. It would include the value of materials on which secured advance has been granted, if any, during the quarter, less the value of materials in respect of which the secured advance has been recovered, if any during the quarter.

Adjustment for Steel component:

$V_S = 0.85 \text{ X } P_S / 100 \text{ X R X } (S_1 - S_0) / S_0$

V_S = Increase or decrease in the cost of work during the quarter under consideration due to changes in rates for Steel.

S_0 = The all India average wholesale price index for Steel (Bars and Rods) for the quarter preceding the date of opening of bids as published by the Ministry of Industrial Development, Government of India, New Delhi.

S_1 = The all India average wholesale price index for Steel (Bars and Rods) for the quarter under consideration as published by the Ministry of Industrial Development, Government of India, New Delhi.

P_S = Percentage of Steel component of work calculated based on Corporation data

R = Total value of work done during the quarter excluding cost of materials and electrical energy supplied by the Employer at fixed prices. It would include the value of materials on which secured advance has been granted, if any, during the quarter, less the value of materials in respect of which the secured advance has been recovered, if any during the quarter.

Adjustment for Local Materials:
$Vm = 0.85 \text{ X } Pm / 100 \text{ X R X } (M_1 - M_0) / M_0$

Vm = Increase or decrease in the cost of work during the quarter under consideration due to changes in rates for local materials other than Cement, Steel, Bitumen and POL.

M_0 = The all India average wholesale price index (all commodity) for the quarter preceding the date of opening of bids as published by the Ministry of Industrial Development, Government of India, New Delhi.

M_1 = The all India average wholesale price index (all commodities) for the quarter under consideration as published by the Ministry of Industrial Development, Government of India, New Delhi.

Pm = Percentage of Local material component (other than Cement, Steel, Bitumen and POL) of work calculated based on Corporation data

R = Total value of work done during the quarter excluding cost of materials and electrical energy supplied by the Employer at fixed prices. It would include the value of materials on which secured advance has been granted, if any, during the quarter, less the value of materials in respect of which the secured advance has been recovered, if any during the quarter.

Signature of the Tenderer

The following formula will govern the price adjustment for the entire contract.

1. Labour - $V_L = 0.85 \times P_l / 100 \times R \times (L_1 - L_0) / L_0$

2. Cement - $V_C = 0.85 \times P_C / 100 \times R \times (C_1 - C_0) / C_0$

3. Steel – $V_S = 0.85 \times P_S / 100 \times R \times (S_1 - S_0) / S_0$

4. Other materials – $Vm = 0.85 \times Pm / 100 \times R \times (M_1 - M_0) / M_0$

Total **100%**

48. Retention

48.1 The Employer shall retain from each payment due to the Contractor the proportion stated in the Contract Data until Completion of the whole of the Works.

48.2 On Completion of the whole of the Works half the total amount retained is repaid to the Contractor and half when the Defects Liability Period has passed and the Engineer has certified that all Defects notified by the Engineer to the Contractor before the end of this period have been corrected.

48.3 On completion of the whole works, the contractor may substitute retention money with an "on demand" Bank guarantee.

49. Liquidated Damages

49.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the Contract Data for each day that the Completion Date is later than the Intended Completion Date (for the whole of the works or the milestone as stated in the contract data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages does not affect the Contractor's liabilities.

49.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Engineer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate.

50. Deleted

51. Advance Payment

51.1 The Employer shall make mobilization advance payment to the Contractor an amount of 5% of the contract price, against provision by the Contractor of irrevocable Bank Guarantee in a form and by a bank acceptable to the Employer in amounts and currencies equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the contractor. Interest will be charged at an interest rate14.5% on the advance payment.

'The bank guarantee of a joint venture shall be in the name of the joint venture'.

51.2 The Contractor is to use the advance payment only to pay for Equipment, Plant and Mobilisation expenses required specifically for execution of the works. The contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Engineer.

51.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done.

52. Securities

52.1 The Performance Security (including additional security for unbalanced bids) shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form and by a bank or surety acceptable to the Employer, and denominated in Indian Rupees. The Performance Security shall be valid until a date 28 days from the date of expiry of Defects Liability Period and the additional security for unbalanced bids shall be valid until a date 28 days from the date of issue of the certificate of completion.

'The performance security of a joint venture shall be in the name of the joint venture'.

53. Deleted

54. Cost of Repairs

54.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

E. Finishing the Contract

55. Completion

55.1 After completion of the works as per specification, Drawings and the Quality and Quantity check by QAQC personnel, the Contractor shall request the Engineer to issue a Certificate of Completion of the Works and the Engineer will do so upon deciding that the Work is completed.

56. Taking Over

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

57. Final Account

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

58. Operating and Maintenance Manuals

58.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the Contract Data.

58.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the Contract Data, or they do not receive the Engineer's approval, the Engineer shall withhold the amount stated in the Contract Data from payments due to the Contractor.

59. Termination

59.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

59.2 Fundamental breaches of Contract include, but shall not be limited to the following:

(a) the Contractor stops work for 28 days when no stoppage of work is shown on the current program and the stoppage has not been authorized by the Engineer;

(b) the Engineer instructs the Contractor to delay the progress of the Works and the instruction is not withdrawn within 56 days;

(c) the Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(d) a payment certified by the Engineer is not paid by the Employer to the Contractor within 90 days of the date of the Engineer's certificate;

(e) the Engineer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer;

(f) the Contractor does not maintain a security which is required;

(g) the Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract data; and

(h) if the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in the executing the Contract.

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

(i) “The contractor (in case of joint venture) has modified the composition of the joint venture and/or the responsibility of each member of the joint venture from what is stated in joint venture agreement without prior approval of the Employer”.

59.3 When either party to the Contract gives notice of a breach of contract to the Engineer for a cause other than those listed under Sub Clause 59.2 above, the Engineer shall decide whether the breach is fundamental or not.

59.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

59.5 If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible.

60. Determination upon Termination

60.A Determination of Contract due to Default or failure of the Contractor:

The commissioner may without prejudice to the rights of the Corporation against the contractor in respect of any delay or inferior workmanship or otherwise, or any claims for damage in respect of any breaches of the contract and whether the date for completion has or has not elapsed by notice in writing absolutely determine the contract in any of the following cases:-

(a) If the contractor, having been given by the Superintending Engineer a notice in writing to rectify reconstruct or replace any defective work or a notice in writing that the work is being performed in an inefficient or otherwise improper manner or that the commencement of the work is being delayed or has been suspended so that in judgment of the Superintending Engineer the contractor will be unable to secure the completion of the work by that date, for completion or he has already failed to complete the work by that date shall omit to comply with the requirements of such notice for a period of seven days thereafter. Such notice under the provisions of this Articles and must specify the act or default on the part of the contractor upon which it is based:

(b) (i) If the contractor being an individual or where the contactor is a firm or any partner that firm shall, at any time become bankrupt, or shall have a receiving order made against him or shall make any composition or arrangement with or for the benefit of his creditors, or shall make any conveyance or assignment for the benefit of his creditors, or shall purport to do so; or

(ii) If the contractor, being a company, shall pass a resolution, or the Court shall make an order that the company be wound up, or if receiver or manager on behalf of creditor shall be appointed or if circumstances shall arise which entitle the Court or a creditor to appoint a receiver or manager entitle the court to make a winding up order.

(c) If the contractor dies, becomes instance or is imprisoned:

Provided always that such determination shall not prejudice or affect any right of action or remedy which shall have accrued or accrue thereafter to the Corporation.

Provided further, that after the notice under condition (a) herein shall have been served on the contractor he shall not be at liberty to remove from the site of the work or from adjoining ground any plant materials and equipment belonging to him and placed thereon for the purpose of the work. and the Corporation shall have a lien upon all such items subsisting from the date of such notice until the notice ! shall have been complied with the Superintending Engineer shall have power to post watchman at the site of the work and/or the ground continuous there to prevent the removal of any plant, materials and equipment upon which the Corporation shall a lien. .

Forfeiture and Partial Determination:

Not withstanding the failure of the contractor to comply with the notice served on him under clause 60A(a) herein, the Superintending Engineer may in his discretion permit the contractor to proceed with the work in conformity with the contract. Such permission shall carry with it the forfeiture of the sum of money not exceeding 5 percent of the total of the finished contract amount provided however that this forfeiture may be modified or revoked by Commissioner.

It shall be further right of the Commissioner under this Para, to determine any part of the contract and to proceed with the execution of the relative portion of the work through any other agency in order to maintain the rate of progress stipulated in the contract. Such omission shall not be a waiver

of any condition of the contract nor invalidate any of the provisions thereof. The contract shall diligently proceed with the portions of the work left to him and payment of money due or may become due shall only be made after deducting there from the extra cost as ascertained by the Superintending Engineer that may be involved in executing parts of the work through other agency. The decision of the Commissioner in this respect shall be final adobe final and conclusive:

Provisions in case of Absolute Determination of Contract:

If the Commissioner shall in the exercise of the powers contained in Clause 60(A) and the value of such as may have been executed but not paid for and al) other sums of money that may then be dur or becoming due from the department to the contractor shall cease to be due or become due.

(1) (a) The earnest money, the security deposit, the total withheld under clause 43.4 (Unfixed Materials No payment or advance will be made for unfixed materials when the rates are for finished work "in situ".') and the value of such work as may have been executed but not paid for and all other sums of money that may then be due or becoming due from the department to the contractor shall cease to be due or become due.

(b) The Commissioner may enter upon and take possession of site and of the materials, tools, plant and equipment thereon, and may purchase materials and do all other acts requisite, for the completion of the work. He may employ other contractors to complete the same, and the contractor shall have no claim whatsoever in respect of such action by the Commissioner,

(c) The contractor shall, if required by the Commissioner assign to the Corporation without further payment, the benefit of any sub-contract or sub-contracts he may have made in connection with the contract and the Corporation shall pay to such person or persons the price (or the balance thereof remaining unpaid), which the contractor may have agreed to pay there under.

(d) Upon completion of the work Superintending Engineer shall certify the cost of completion, which shall include

(i) The cost of any materials purchased and labour provided to secure completion of the work, including the making good of any defects and faulty work, together with the addition of such percentage to cover supervision and establishment charges as may be decided by the Superintending Engineer.

(ii)The cost of work, executed by other contractors to secure completion of the work, including the making good of any defects and faulty work:

(iii)The cost of maintenance of the portion of the work completed by the contractor.

(2) If the cost of completion, after taking into account all credits from any sales of materials, plant and equipment brought on the site by the contractor prior to the date of determination, added '0 the actual sums paid to the contractor up to this date is less than the sums which would have been payable to the contractor for due completion, the contractor shall be paid the difference provided that the amount so payable shall not exceed the aggregate of:-

(i) the value of the work executed up to the date of determination;

(ii) the value of such of the said materials as are subsequently incorporated in the work or otherwise disposed of; and

(iii) the value of any such plant and equipment disposed of less the amount already paid under the contract. Any such materials, plant and equipment as are unsold or unused when the works are completed shall be returned to the contractor.

(3) If the cost *of* completion added to the sum actually paid to the contractor upto the date of completion exceeds the sum which would have been payable to the contractor for due completion and the Commissioner may apply the proceeds of the sale of plant; materials and equipment provided by the contractor on the site in reduction of such excess and any deficit shall be recoverable from the contractor, If after such excess has been met, there remains any residue of the proceeds of the sale of the plant, materials and equipment or any unsold plant, materials and equipment shall be paid or returned to the contractor as the case may be.

(4) In the event of determination of the contract or! account of the death, insanity, insolvency or imprisonment of the contractor, the notice determination of contract required under Clause 60(A) shall be posted at the site of the work and advertised in one issue of the local dailies.

The provisions of the preceding paragraphs (1) to (3) of this Articles shall then take effect, and payment shall be made and unsold plant, materials and equipment shall be retuned to the person or persons entitled to receive and give a valid discharge.

Special Powers of Determination: .

These powers shall be exercised in the event of complete stoppage or abandonment of work under the orders of the Corporation Councillor Government.

(a)The Commissioner shall, in addition to any other powers enabling him to determine the contract have power to determine the contract at any time by notice inn writing to the contractor, and upon receipt by the contractor of the notice the contract shall be determined but without prejudice to the rights of the parties accrued to the date of determination and to the operation of the following provisions of these Article.

(b)The Commissioner shall, as soon as practicable and in any case not later than the expiration - of three months from the date of such notice of the period up to the date for completion, whichever is the shorter, give directions (with which the contractor shall comply with all reasonable despatct"1 as to all or any of the following matters. that is to say:

(i) the performance of further work in accordance with the provisions of contract.

(ii) the protection of the work executed under the contract in compliance with directions given under sub-paragraph (1) above. .

(iii) the removal of all plant, temporary buildings and equipment from the site;

(iv) the removal of materials placed on the site; ,

(v) the clearing of the site;

(vi) any other matter arising out of the contract with regard to which the Commissioner decide that directions are necessary or expedient.

(c) The commissioner may at any time within the period referred to in paragraph (b) herein by notice in writing to the contract vary any direction so given or give fresh directions as to all or any of the matter. specified in the foregoing paragraph.

(d) In the event. of the determination of the contract under this condition there shall be paid to the contractor the net amount due as ascertained in accordance with all the applicable provisions of payment hereof including valuation in the same manner as increased or decreased quantities, extra work and omitted items.

These shall be deducted from any sum payable to the contractor under this sub-clause the amount of all payments previously made to the contractor in respect of the contract, and the Commissioner shall ! have the right to retain any reserve accumulated in his possession at the date of determination until the final settlement of all claims made by the contractor.

(e) Any dispute of difference which may arising between the parties as to the carrying out of those conditions shall be referred to arbitration and the provisions with regard to arbitration.

61. Property

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

62. Release from Performance

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

63. Iron Barricading

Iron barricading units shall be arranged in a continuous row using interlocking arrangements. These can be placed along the excavated trench to provide adequate safety measures. The period of time elapsing between the earth work and placing of concrete for cover slab shall be maximum of 28 days. The tenderer should cover the Storm Water drain within the 28 days of barricading period. Failure to complete the work within the period, the tenderer is bound to provide the barricading as safety measures. The tenderer will not be allowed to remove or lift the barricading units until drain is covered. In such event no payment will be entertained for barricading. Iron barricading is a temporary barricading and can be removed and reused after the completion of work in a particular stretch.

64.Levels

Before commencement of each Storm water Darin work the invert levels of disposal points should be taken for finalising the invert level of the progressive Storm Water Drain. While construction, the invert levels at every 15m shall be checked and recorded. These level book shall be kept at site office for verification. Permanent Bench mark shall be constructed at the specific locations wherever directed by the Engineer-in –Charge.

65. Drain alignment

Trial pits at every 50M to be made to ascertain the under ground services. These trial pits are essential to decide the alignment of drain and to avoid service lines in the vent way. Construction of Storm Water drain work should be carried out in such a way that longitudinal service lines does not fall within the vent way. All the drain works shall be started from the disposal points and every stage the levels should be maintained as per the approved drawing.

F. Special Conditions of Contract

1. Labour :

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

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

2. Compliance With Labour Regulations :

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

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

3. SALIENT FEATURES OF SOME MAJOR LABOUR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN BUILDING AND OTHER CONSTRUCTION WORK.

a) Workmen Compensation Act 1923: The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

b) Payment of Gratuity Act 1972: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years service or more or on death the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

c) Employees P.F. and Miscellaneous Provision Act 1952: The Act Provides for monthly contributions by the employer plus workers @ 10% or 8.33%. The benefits payable under the Act are :

(i) Pension or family pension on retirement or death, as the case may be.

(ii) Deposit linked insurance on the death in harness of the worker.

(iii) payment of P.F. accumulation on retirement/death etc.

d) Maternity Benefit Act 1951: The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

e) Contract Labour (Regulation & Abolition) Act 1970: The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by Law. The Principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more contract labour.

f) Minimum Wages Act 1948: The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.

g) Payment of Wages Act 1936: It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

h) Equal Remuneration Act 1979: The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.

i) Payment of Bonus Act 1965: The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs.3500/-per month or less. The bonus to be paid to employees getting Rs.2500/- per month or above upto Rs.3500/- per month shall be worked out by taking wages as Rs.2500/-per month only. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.

j) Industrial Disputes Act 1947: The Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

k) Industrial Employment (Standing Orders) Act 1946: It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority.

l) Trade Unions Act 1926: The Act lays down the procedure for registration of trade unions of workmen and employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.

m) Child Labour (Prohibition & Regulation) Act 1986: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry.

n) Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979: The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home upto the establishment and back, etc.

o) The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996: All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the Building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

p) Factories Act 1948: The Act lays down the procedure for approval at plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

4. Safety Measures:

1. The contractor shall take necessary precautions for safety of the workers and preserving their health while working in such jobs, which require special protection and precautions. The following are some of the measures listed but they are not exhaustive and contractor shall add to and augment these precautions on his own initiative where necessary and shall comply with directions issued by the Executive Engineer or on his behalf from time to time and at all times.

2. Providing protective foot wear to workers situations like mixing and placing of mortar or concrete sand in quarries and places where the work is done under much wet conditions.

3. Providing protective head wear to workers at places like under ground excavations to protect them against rock falls.

4. Providing masks to workers at granulates or at other locations where too much fine dust is floating about and sprinkling water at frequent intervals by water hoses on all stone crushing area and storage bins abate to dust.

5. Getting the workers in such jobs periodically examined for chest trouble due to too much breathing in to fine dust.

6. Taking such normal precautions like fencing and lightening in excavation of trenches, not allowing rolls and metal parts of useless timber spread around, making danger areas for blasting providing whistles etc.

7. Supply work men with proper belts, ropes etc., when working in precarious slopes etc.

8. Avoiding named electrical wire etc., as they would electrocute the works.

9. Taking necessary steps towards training the workers concerned on the machinery before they are allowed to handle them independently and taking all necessary precautions in around the areas where machines hoists and similar units are working.

10. Hand gloves used for handling the electrical cable.

5. Fair Wage Clause:

The contractor shall pay not less than fair wages to labourers engaged by him on the work.

"Fair" wages means wages whether for time of piecework notified by the Government from time in the area in which the work is situated.

The contractor shall not with-standing the revisions of any contract to the contrary cause to be paid to the labour, in directly engaged on the work including any labour engaged by the sub-contractor in connection with the said work, as if the labourers had been directly employed by him.

In respect of labour directly or indirectly employed in the works for the purpose of the contractors part of the agreement the contractor shall comply with the rules and regulations on the maintenance of suitable records prescribed for this purpose from time to time by the Government. He shall maintain his accounts and vouchers on the payment of wages to the labourers to the satisfaction of the Executive Engineer.

The Executive Engineer shall have the right to call for such record as required to satisfy himself on the payment of fair wages to the labourers and shall have the right to deduct from the contract amount a suitable amount for making good the loss suffered by the worker or workers by reason of the "fair wages" clause to the workers.

The contractor shall be primarily liable for all payments to be made and for the observance of the regulations framed by the Govt. from time to time without prejudice to his right to claim indemnity from his sub-contractors.

As per contract labour (Regulation and abolition) Act. 1970 the contractor has to produce the license obtained from the licensing officers of the labour department along with the tender or at the time of agreement.

Any violation of the conditions above shall be deemed to be a breach of his contract.

Equal wages are to be paid for both men and women if the nature of work is same and similar.

The contractor shall arrange for the recruitment of skilled and unskilled labour local and imported to the extent necessary to complete the work within the agreed period as directed by the Executive Engineer in writing.

6. Liabilities of the Contractor:

1. Accident Relief and workmen compensation:

The contractor should make all necessary arrangements for the safety of workmen on the occurrence of the accident, which results in the injury or death of any of the workmen employed by the contractor, the contractor shall within 24 hours of the happenings of the accident and such accidents should intimate in writing to the concerned Asst. Engineer / Asst. Executive Engineer of

the Department the act of such accident. The contractor shall indemnify Government against all loss or damage sustained by the Government resulting directly or indirectly from his failure to give intimation in the manner aforesaid including the penalties or fines if any payable by Govt. as a consequence of Govt. failure to give notice under workmen's compensation Act or otherwise conform to the provisions of the said Act. In regard to such accident.

2. In the event of an accident in respect of which compensation may become payable under the workmen's compensation Act VIII 23 whether by the contractor, by the Government it shall be lawful for the Executive Engineer to retain such sum of money which may in the opinion of the Executive Engineer be sufficient to meet such liability. The opinion of the Executive Engineer shall be final in regard to all matters arising under this clause.

3. The contractor shall at all times indemnify the Govt. of Tamil nadu. against all claims which may be made under the workmen's compensation act or any statutory modification thereafter or rules there under or otherwise consequent of any damage or compensation payable in consequent of any accident or injuries sustained or death of any workmen engaged in the performance of the business relating to the contractor.

7. Delay and Extension of Contract Time of Completion (Extension of contract period)

If the works be delayed by

(a) Force majeure,or
(b) Abnormally bad weather, or
(c) Serious loss or damage by fire or
(d) Civil Commotion, local combination of workmen, strike or lockout, affecting any of the trades employed on the work or
(e) Delay on the part of other contractors, in executing work on which the progress of the work under this contract is dependent but does not form part of the contractor, or
(f) Any other causes which in the absolute discretion of the Employer is beyond the contractor's control.
(g) Due to any additional work or modification / changes in design.

8. Damages to under ground services

During execution of works if contractor causes any damages to the under ground services like Metro Water pipe lines, TNEB, Chennai Telephones, Corporation Street Light Cable, and other OFC cables etc.,it should be restored to its original position by the contractor with their cost. Further if any damage charges claimed by the service departments also be borne by the contractor. Chennai Corporation will not make any payment to that effect. However the cost of shifting of any underground services if required will be borne by the Corporation of Chennai.

9. Service routes maps not readily available with Employer, the contractor should ascertain the service availability from the service providers.

10. Carting of earth

The contractor should cart the excess earth from the site and shall be dumped and levelled in the site identified by the Corporation of Chennai. The contractor will be paid for the actual lead. The surplus earth, debris and silt will be measured in volume and 25% will be deducted as bulkage from the total quantity.

11. Protection of adjoining premises:

The contractor shall protect adjoining sites against structural, decorative and other damages that could be caused by the execution of these works and make good at his cost any such damages.

12. Work during night or on Sundays and holidays:

The works can be allowed to be carried out during night, Sundays or authorised holidays in order to enable him to meet the schedule targets and the work shall require almost round the clock working keeping in view:

(i) The provisions of relevant labour laws being adhered to:

(ii) Adequate lighting, supervision and safety measures are established to the satisfaction of the Engineer-in-Charge and

(iii) The construction programme given by the Contractor and agreed upon by the Engineer-in-Charge envisages such night working or working during Sundays or authorised holidays

(iv) Separate payment will not be made for Night Works and holiday works.

13. Plant and Equipment:

(i) The contractor shall have sufficient plant, equipment and labour and shall work such hours and shifts as may be necessary to maintain the progress on the work as per the approval progress schedule. The working and shifts hours shall comply with the Govt. Regulations in force.

(ii) It is to expressly and clearly understood that contractor shall make his own arrangements to equip himself with all machinery and special tools and plant for the speedy and proper execution of the work and the department does not undertake responsibility towards their supply.

14. Steel forms:

Steel forms should be used for all items involving and use of centring and shuttering shall be single plane without any dents and undulations.

15. Inconvenience to public:

The contractor shall not deposit materials at any site, which will cause inconvenience to public. The Engineer-in-Charge may direct the contractor to remove such materials or may undertake the job at the cost of the contractor.

16. Conflict of interest:

Any bribe, commission, gift or advantage given, promised or offered by on behalf of contractor or his partner, agent or servant or any one on his behalf to any officer, servant, representatives, agents of Engineer-in-Charge, or any persons on their behalf, in relation to the obtaining or to execution of this, or any other contract with Engineer-in-Charge shall in addition to any criminal liability, which it may occur, subject to the cancellation of this or all other contracts and also to payment of any loss or damage resulting from any such cancellation. Engineer-in-Charge shall then be entitled to deduct the amount, so payable from any money, otherwise due to the contractor under this or any other contract.

17. Contract documents and materials to be treated as confidential:

All documents, correspondences, decisions and orders, concerning the contract shall be considered as confidential and/or restricted in nature by the contractor and he shall not divulge or allow access to them by any unauthorised person.

18. General obligations of Contractor:

1. The contractor shall, subject to the provision of the contract and with due care and diligence, execute and maintain the works in accordance with specifications and drawings.

2. The contractor shall promptly inform the Department and the Engineer-in-Charge of any error, omission, fault and such defect in the design of or specifications for the works which are discovered when reviewing the contract documents or in the process of execution of the works.

3. If Contractor believes that a decision taken by the Engineer-in-Charge was either outside the authority given to the Engineer-in-Charge by the Contract or that the decision was wrongly taken, the decision shall be referred to the technical expert within 14 days of the notification of the Engineer-in-Charge's decisions.

4. Pending finalisation of disputes, the contractor shall proceed with execution of work with all due diligence.

19. Security measures:

a) Security requirements for the work shall be in accordance with the Government's general requirements including provisions of this clause and the Contractor shall conform to such requirements and shall be held responsible for the actions of all his staff, employees and the staff and employees of his sub-contractors.

b) All contractors' employees, representatives and sub-contractor's employees shall wear identifications badges provided by the contractor. Badges shall identify the contractor, showing and employee's number and shall be worn at all times while at the site. Individual labour will not be required to wear identification badges.

c) All vehicles used by the contractor shall be clearly marked with contractor's name.

d) The contractor shall be responsible for the security of the works for the duration of the contract and shall provide and maintain continuously adequate security personnel to fulfill these obligations. The requirements of security measures shall include, but not limited to maintenance of order on the site, provision of all lighting, fencing, guard flagmen and all other measures necessary for the protection of the works within the colonies, camps and elsewhere on the site, all materials delivered to the site, all persons employed in connection with the works continuously throughout working and non working period including nights, Sundays and holidays for duration of the contract.

e) Other contractors working on the site concurrently with the contractor will provide security for their own plant and materials. However, their security provisions shall in no way relieve the contractor of his responsibilities in this respect

f) Separate payment will not be made for provision of security services.

20. Fire fighting measures:

a) The contractor shall provide and maintain adequate fire fighting equipment and take adequate fire precaution measures for the safety of all personnel and temporary and permanent works and shall take action to prevent damage to destruction by fire of trees shrubs and grasses.

b) Separate payment will not be made for the provision of fire prevention measures.

21. Sanitation:

The contractor shall implement the sanitary and watch and ward rules and regulations for all forces employed under this contract and if the Contractor fails to enforce these rules, the Engineer-in-Charge may enforce them at the expenses of the Contractor.

22. Possession prior to completion:

The Engineer-in-charge shall have the right to take possession of or use any completed part of work or works or any part there of under construction either temporarily or permanently. Such possession or use shall not be deemed as an acceptance of any work either completed or not completed in accordance with the contract or otherwise specified by the Engineer-in-charge.

23. Drawing to be kept at site:

One copy of the drawings furnished to the contractor shall be kept by the contractor on the site and the same shall at all reasonable time be available for inspection and use by the Engineer-in-Charge/QAQC Technical Personnel and the Engineer-in-Charge's representative and by any other persons authorised by the Engineer-in-Charge in writing.

24. Site Order Book:

An order book shall be kept at the site of the work. As far as possible, all orders regarding the work are to be entered in this book. All entries shall be signed and dated by the Department Officer in direct charge of the work. The findings and observations shall be recorded by QAQC and by the contractor or by his representative. In important cases, the Executive Engineer or the Superintending Engineer will countersign the entries, which have been made. The order book shall not be removed from the work, except with the written permission of the Executive Engineer. The findings of defective works recorded by Engineer in charge or QAQC personnel in the site order book should be rectified by the contractor.

25. Variations by way of modification, omissions or additions:

For all modifications, omissions from or additions to the drawings and specifications, the Executive Engineer will issue revised plans, or written instructions, or both and no modification, omission or addition shall be made unless so authorised and directed by the Executive Engineer in writing.

The Executive Engineer shall have the privilege of ordering modifications, omission or additions at any time before the completion of the work and such orders shall not operate to annual those portions of the specifications with which said changes do not conflict.

Engineer-in-Charge's Decision:
It shall be accepted as in separable part of the contract that in matters regarding materials, workmanship, removal of improper work, interpretation of the contract drawings and contract specification, mode of the procedure and the carrying out o the work, the decision of the Engineer-in-Charge, which shall be given in writing shall be binding on the contractor.

26. Income tax:

a) During the currency of the contract deduction of income tax at 2% +10% Surcharge with 3% education cess shall be made from the gross value of each bill of the contract, under section 194-C(4) of Income Tax Act, 1961 shall be followed.

b) Income Tax clearance certificate should be furnished before the payment of final bill.

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

27. Sales tax:

a. Sales Tax during the currency of the contract deduction towards Tamilnadu Sales Tax under section.7F of Tamil Nadu General sales tax Act 1959. according to which tax @ 2% (Changed as time to time) has to be deducted at source, while making payments to the contractor.
b. The contractor should produce a valid Sales Tax Clearance Certificate before the payment of the final bill, otherwise payment to the contractor will be withheld.

28. Supply of construction materials:

i) The contractor has to make his own arrangements for procurements, supply and use of construction materials.

ii) All materials so procured should confirm to the relevant specifications indicated in the bidding documents.

iii) The contractor shall follow all regulations of the Department/Government of India in respect of import licences etc., of the procurement of the materials is through imports and he shall be responsible for the payment of applicable duties and taxes, port clearances, inland transportation etc.

iv) The contractor shall make his own arrangements for adequate storage of the materials.

29. Sub-Contracting (CC Clause 7)

30. Arbitration (CC Clause 25.3)

The procedure for arbitration will be as follows :

(a) In case of Dispute or difference arising between the Employer and a domestic contractor relating to any matter arising out of or connected with this agreement, such disputes or difference shall be settled in accordance with the Arbitration and Conciliation Act, 1996. The arbitral tribunal shall consist of 3 arbitrators one each to be appointed by the Employer and the Contractor. The third Arbitrator shall be chosen by the two Arbitrators so appointed by the Parties and shall act as Presiding arbitrator. In case of failure of the two arbitrators appointed by the parties to reach upon a consensus within a period of 30 days from the appointment of the arbitrator appointed subsequently, the Presiding Arbitrator shall be appointed by President of the Institution of Engineers (India).

(b) In the case of dispute with a Foreign contractor the dispute shall be settled in accordance with provisions of UNCITRAL Arbitration Rules. The Arbitral Tribunal shall consist of three Arbitrators one each to be appointed by the Employer and the Contractor. The third Arbitrator shall be chosen by the two Arbitrators so appointed by the Parties, and shall act a presiding arbitrator. In case of failure of the two arbitrators appointed by the parties to reach upon a consensus within a period of 30 days from the appointment of the arbitrator appointed subsequently, the Presiding arbitrator shall be appointed by the President of the Institution of Engineers (India).

(c) If one of the parties fails to appoint its arbitrator in pursuance of sub-clause (a) and (b) above within 30 days after receipt of the notice of the appointment of its arbitrator by the other party, then the President of the Institution of Engineers (India), both in cases of the Foreign Contractor as well as Indian Contractor, shall appoint the arbitrator. A certified copy of the order of the President of the Institution of Engineers (India), making such an appointment shall be furnished to each of the parties.

(d) Arbitration proceedings shall be held at Chennai, India, and the language of the arbitration proceedings and that of all documents and communications between the parties shall be English.

(e) The decision of the majority of arbitrators shall be final and binding upon both parties. The cost and expenses of Arbitration proceedings will be paid as determined by the arbitral tribunal. However, the expenses incurred by each party in connection with the preparation, presentation, etc. of its proceedings as also the fees and expenses paid to the arbitrator appointed by such party or on its behalf shall be borne by each party itself.

(f) Where the value of the contract is Rs.50 Million and below, the disputes or differences arising shall be referred to the Sole Arbitrator. The Sole Arbitrator should be appointed by agreement between the parties; failing such agreement, by the appointing authority, namely the President of the Institution of Engineers (India).

(g) Performance under the contract shall continue during the arbitration proceedings and payments due to the contractor by the owners shall not be withheld, unless they are the subject matter of the arbitration proceedings.

31. Protection Of Environment:

Add the following as CC Clause 16.2:

The contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

During continuance of the contract, the contractor and his sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made thereunder, regulations,

notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

Salient features of some of the major laws that are applicable are given below :

The Water (Prevention and Control of Pollution) Act, 1974, This provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. 'Pollution' means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.

The Air (Prevention and Control of Pollution) Act, 1981, This provides for prevention, control and abatement of air pollution. 'Air Pollution' means the presence in the atmosphere of any 'air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

The Environment (Protection) Act, 1986, This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

The Public Liability Insurance Act, 1991, This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.

[Employers should note that the Loan Agreement between IBRD and the borrowing country may establish specific measures to be taken during construction of the Works for the protection of the environment. Sub-clause 16.2 should be modified/expanded to take into account such specific measures or other measures considered appropriate by the Employer]

32. Liquidated Damages:

The liquidated damages shall be on per day basis at 0.05% of the total value of work. Maximum amount of liquidated damages for the whole of the work will be 5% of the total value of work.

For this project the liquidated damages for the whole of the work per day is **Rs.2,61,000.00**
The liquidated damages for the mile stones are as under.

For milestone **1** **Rs. 39,150 per day**
For milestone **2** **Rs. 78,300 per day**
For milestone **3** **Rs. 78,300 per day**
For milestone **4** **Rs. 65,250 per day**

Recovery of the liquidated damages collected in the different milestone will be refunded in the event of work completed within the total contract period.

"Time is the essence of the contract and payment or deduction of liquidated damages shall not relieve the contractor from his obligation to complete the work as per agreed construction program and milestones or from any other of the contractor's obligations and liabilities under the contract."

33. Special conditions of Contract: General

1. General

The contractor is advised to note that the following Special conditions are part of the contract and he will not have any right to claim at any time for delays or for expenditures incurred by him in fulfilling the following special conditions.

2. The Scope of Work includes

a. Site office in the Project area
b. Safety and security to the equipments and manpower engaged

3. Tender Drawings

The drawings issued with the tender documents are Tender Drawings and they prepared in such a detail to give comprehensive idea of the work. The good for construction drawing will be issued during the construction stage based on the requirements and as per the construction program submitted by the contractor as per the clause CC clause 27.

4. Working Drawings

The Contract Drawings supplemented by the working drawings or shop drawings prepared by the contractor which are required for the execution of the works. These works shall include the details required for the execution of the work. And any other detail the engineer may ask during construction.

All drawings shall be computerised and shall be submitted both in hard and soft copies as well as digital data.

Approval by the Engineer in charge of the Contracts shall not relieve the contractor from the responsibility for the accuracy of the dimension and detail, nor shall such mutual agreement and compliance to his working drawing shall constitute an acceptance by the employer of the correctness and adequacy of the drawings.

The Drawings are to be submitted for review to the engineer in charge sufficiently in advance. Upon approval of the drawings by the engineer in charge, the construction shall be started. delay of works, due to lack of approval of working or shop drawings are deemed to be risk the contractor is taking with full knowledge and no compensation shall be claimed by the contractor or none given by the employer on account of the delay in such cases.

The cost of furnishing working drawings shall be included in the rates for various paying items given the bill of quantities.

In this respect the contractor shall employ his engineer and auto cad draughts person specifically or planning and preparation of working drawings. The contactor shall also provide as a part of the mobilization to the site, latest computers and software together with new colour printer, for the preparation of his working drawings. The Engineer/ QAQC personnel shall have access to these computers.

5. Additional Works

Any additional works, instructed during the contract period and within the contract amount will be paid as per bill of quantity rates and it shall not be considered as a cause for the contractor to claim for delay incurred overhead, mobilization etc.,

6. Protection of the Works during Contract Period

Its is clearly understood that any damage occurring to the works (completed or in execution) is the contractors responsibility and no extra claims will be entertained by the employer since the matter shall be covered in the relevant insurances.

7. Discrepancies in the alignment

Discrepancies in the alignment and levels etc., noticed during the construction and on /or completion shall be rectified by the contractor at his own cost. Engineers approval doesn't relieve him from his responsibilities.

8. Temporary Power and Water Supply

All costs, both for water and power supply and temporary installations for the work shall be borne by the contractor.

9. Contractor Facilities

9.1 Site Offices of the Contractor

The successful Tenderer is to provide and maintain a site office as directed by the Engineer.

The Contractor shall submit to the Engineer his proposed layout of the site office for approval. The site office must be ready for use within 15 days from the date of work order or delivery of materials at site, whichever is earlier.

The Contractor shall store a daily updated progress information on a computer at the site office, for the review of the Engineer/QAQC personnel. Throughout the whole period as specified below during which the site office is being occupied and used by the Contractor, he shall provide, pay for all charges and maintain at his own expense electricity, water and telephone facilities for the site office. The Contractor shall provide sufficient water tanks to ensure constant supply of potable water for the site office at all times.

The Contractor shall provide acceptable septic tank with connections for sewage disposal. This shall be at a distance of more than 10m from any building. The Contractor shall keep the site office clean and tidy.

The site office with all those provisions mentioned above shall be provided and maintained by the Contractor throughout the whole construction period and until three months after the

issuance of the Preliminary Handing Over Certificate or until all the work required under the Contract are in the opinion of the Engineer 100% (one hundred percent) completed, which ever period is the later one.

The office and its facilities will not, however, be removed from the site without prior written approval of the Engineer

9.2 Surveying Equipment

The Contractor shall provide, at his own expense Two approved sets of surveying and measuring equipment for the sole use of the Representative of Engineer/ QAQC Technical Personnel. The set shall consist of (i) One Total Station, (ii) One pogo with reflector, (iii) One big tripod (iv) One small tripod (v) Two fibre glass tape (cased 30 m) (vi) Four steel pocket tape 3 m long (vii) Two surveying umbrellas (viii) Ten ranging rods 2.5 m long (ix) Required numbers of level books and field books.

All accessories and assistance required for setting out, measuring etc. shall be supplied as and when required by the Engineer/ QAQC or his representative.

The contractor shall be solely responsible for the maintenance of all such instruments and equipments and shall ensure that they are at all times in good working condition.

All the surveying equipments shall remain the property of the Contractor at the end of the Contract. The Contractor is obliged to replace any instrument or part thereof damaged during the Contract Period.

There will be no direct payment for surveying equipment. It is deemed to be included in the various pay items in the Bill of Quantities.

9.3 Laboratory and Laboratory Testing

The minimum requirement of equipments in ground laboratory are listed in Annexure-1.

All the instruments and equipments for lab testing should have valid calibration Certificates and periodical calibrations to be done as per BIS norms.

All tests as specified in the relevant codes to be carried by the contractor in presence of Engineer in charge/Third party QAQC personnel.

The third party QAQC agency appointed by the Corporation of Chennai shall be permitted to use the contractors lab to perform all the tests pertaining to the contract on behalf of Corporation of Chennai.

List of equipments provided in the list is the minimum required for conducting routine and general Quality Control tests. In case any other tests are required to be done, the Department shall direct the bidder to carry out the same from any recognized laboratory acceptable to the Department. There will be no direct payment for laboratory and laboratory testing. It is deemed to be included in the various pay item in the bill of quantities.

10. Notice Boards

Notice Boards as required numbers shall be provided and erected as directed by the Engineer. The boards shall be maintained and repainted if directed by the Engineer till the final handing over of project.

The Contractor shall submit for approval of the Employer and Engineer working drawing showing all details needed in the board and the location of the board. Cost of providing and installing the notice board is deemed to be included in various items of the bill of quantities.

11. Progress Photographs and Reports

Contractor shall submit monthly 6 progress Photographs 15 × 10 cms size in five copies as part of his monthly progress report.

At the end of the work the Contractor shall deliver to the Engineer two albums having the most significant Photographs taken during the Contract Period. The above shall be deemed included in the various other pay items.

12. Safety on Site

Measures to ensure safety of workers and plant at site shall be taken by the Contractor. Excavations shall be protected by proper manner and lighting shall be provided at night to warn pedestrians and vehicles. Traffic diversions shall be arranged as per the Traffic management plans to Engineers approval and traffic regulation compliance of works. The Contractor shall designate a Safety Officer who will be in charge of all Safety Measures. The cost of all safety equipments and the cost of providing a safety officer at site would be deemed to be included in various Items of the Bill of quantities.

13. **As Built Drawings**

The Contractor shall prepare As Built Drawings both in hard copy and in digital format.

The drawings shall be prepared for any given section of the work as soon as the work for that particular section is completed. Preparation of As Built Drawings shall keep pace with the work and shall not be left over towards the end of the project. 3 hard copies and one soft copy of all drawings shall be submitted.

No separate payment will be made for the preparation of As-Built Drawings; Cost of preparation of As Built Drawing is deemed to be included in all other priced bill items.

14. Manual Workers General Welfare Fund of the Tamil Nadu Construction workers Welfare Board

0.3% of the Estimate Cost of the work towards Manual workers General Welfare fund of The Tamil Nadu- Construction workers Welfare Board has to be paid by the tenderer. However all other applicable allowances including 0.3% of labour fund should be included in the quoted rates.

Signature of the Tenderer

SECTION 4: CONTRACT DATA

Contract Data

Items marked "N/A" do not apply in this Contract.

The following documents are also part of the Contract:	**Clause Reference**
· The Schedule of Operating and Maintenance Manuals	[58 of CC]
· The Schedule of Other Contractors …….. N/A	[8 of CC]
· The Schedule of Key Personnel	[9 of CC]
· The Methodology and Program of Construction & Environmental Management Plan	[27 of CC]
· The Schedule of Key and Critical equipment to be deployed on the work as per agreed program of construction	[4.5B of ITB]
· Site Investigation reports	[14 of CC]

The Employer is

Name: The Commissioner (1.1 of CC)

Address: Corporation of Chennai,
Ripon Buildings,
Chennai – 600 003.
Phone: 044-25619316

Name of authorized Representative: _____

The Engineer is (1.1 of CC)

Name: The Superintending Engineer,
Storm Water Drain Department

Address: Corporation of Chennai,
Ripon Buildings,
Chennai – 600 003.
Phone: 044-25619316

Name of Authorized Representative: _____

The Adjudicator appointed jointly by the Employer and Contractor is:

*Name : Th.

*Address :

(*to be filled in after the Adjudicator has been appointed)

The name and identification number of the Contract is

Name of work:
Construction of storm water drain works in Adyar Water Shed in Chennai city.

The Works consist of

(a) Construction of Storm Water Drains as per design sections and as per the standard specifications as indicated in the drawings provided with note of good for construction.
(b) Construction of Cross Drainage Works or Culverts along with allied Civil Works

The Start Date shall be the date of issue of notice to proceed with the work.

(1.1 of CC)

The Intended Completion Date for the whole of the Works is **26 months** including monsoon period with the following mile stones. (17 of CC)

PERIOD FROM START DATE

Value of works Above 50 Crores - 26 Months (Including rainy season)

Sl. No.	Item of work	Period from Start date			
		Milestone I (6.5 months)	Milestone II (13 months)	Milestone III (19.5 months)	Milestone IV (26 months)
(i)	Improvements to Canals and Construction of Arterial Drains	15%	45%	85%	100%
(ii)	Construction of Storm water Drains (Feeder and Collector)	15%	45%	75%	100%

The documents also form part of the Contract: [2.3 of CC]

The Contractor shall submit a revised Program including Environmental Management Plan for the Works (in such form and detail as the Engineer shall reasonably prescribe) within **14 days** of delivery of the Letter of Acceptance. [27 of CC]

[This program should be in adequate detail and generally conform to the program submitted along with bid in response to ITB Clause 4.3 (k). Deviations if any from that should be clearly explained and should be satisfactory to the Engineer]

The Site Possession Dates shall be immediately after the letter of acceptance. [21
The Site is located within Chennai Corporation and is defined in drawings enclosed. [1]

The Defects Liability Period is Two Years from the date of certification of completion of works. (where sectional completion certificate is issued this will apply from those dates for those sections). [35 of CC]

Insurance (13 of CC)

Necessary Insurance requirements as per rule in force should be followed for items such as:

(ii) Works and plant and Materials
(iii) Other Property
(iv) Personal injury or death insurance:
  (a) for other people;
  (b) for Contractor's Employees

These events are Compensation Events: [44 of CC]

The period between Program updates shall be **30 days.** [27 of CC]

The amount to be withheld for late submission of updated Program shall be ***Rs.1,00,000*** [27

The language of the Contract documents is English [11 of ITB]

The law which applies to the Contract is the laws of Union of India [3 of CC]

The currency of the Contract is Indian Rupees. [46 of CC]

Fees and types of reimbursable expenses to be paid to the Adjudicator [36 ITB]
Rs.5000/- per sitting on day basis

Appointing Authority for the Adjudicator Chairman, Institution of Engineers (India) [26 of CC]
Tamil Nadu Chapter.

Retention money

[48 of CC]

The proportion of payments retained (retention money) shall be 5% from each running bill .The Contractor shall maintain the works executed by him in proper repair for a period of two years from the date of completion of work in satisfactory condition at his own cost.
$2\ ^{1}/_{2}$ % the total value of work should be retained for a period of 2 years from the date of completion of work, in order to enable the department officers to watch the effect of all seasons on the work.

An indemnity bond for a further period of 3 years should be obtained from the contractors in the form approved by the Government. in G.O.Ms.NO.654 dt. 15-4-88 of P.W.D. so that the contractor shall make good the loss or damage that may be caused to the Corporation of Chennai in respect of rectification of any defect noticed due to the faulty workmanship by the contractor, or substandard materials used by the contractor in the execution of the work.

The liquidated damages shall be on per day basis at 0.05% of the total value of work. Maximum amount of liquidated damages for the whole of the work will be 5% of the total value of work.

For this project the liquidated damages for the whole of the work per day is **Rs.2,61,000.00 [32 of SC]**

The liquidated damages for the mile stones are as under.

For milestone **1** **Rs.39,150 per day**
For milestone **2** **Rs.78,300 per day**
For milestone **3** **Rs.78,300 per day**
For milestone **4** **Rs.65,250 per day**

The amounts of the advance payment are: **[51 of CC]**

Nature of Advance	Amount (Rs.)	Conditions to be fulfilled
1. Mobilization	5% of contract price	Mobilisation advance will be allowed at an interest of 14.5% with Bank Guarantee.

(The advance payment will be paid to the Contractor no later than 15 days after fulfilment of the above conditions).

Repayment of advance payment for mobilization: [51 of CC]

The Securities shall be for the following minimum amounts equivalent as a percentage of the Contract Price: [52 of CC]

Performance Security for 2 percent of contract price plus Rupees…….(a fixed amount) as Additional security for unbalanced bids [*in terms of ITB Clause 30*].

The standard form of Performance Security acceptable to the Employer shall be an unconditional Bank Guarantee of the type as presented in Section 8 of the Bidding Documents.

The date by which operating and maintenance manuals are required is within 28 days of issue [58 of CC]
of certificate of completion of whole or section of the work, as the case may be.

The date by which "as-built" drawings (in scale 1:2000) in 2 sets are required is within 28 days of issue of certificate of completion of whole or section of the work, as the case may be.
[58 of CC]

The amount to be withheld for failing to supply "as built" drawings and/or operating and maintenance manuals by the date required is Rs. 5,00,000 [58 of CC]

The following events shall also be fundamental breach of contract: [59.2]

1. The Contractor has contravened Sub-clause 7 of CC read with SC and Clause 9.0 of CC
2. The contractor does not adhere to the agreed construction program (Clause 27 of CC) and also fails to take satisfactory remedial action as per agreements reached in the management meetings (Clause 31) for a period of 60 days.
3. The contractor fails to carry out of the instructions of Engineer within a reasonable time determined by the Engineer in accordance with CC Clause 16.1 and 23.1.

The percentage to apply to the value of the work not completed representing the Employer's additional cost for completing the works shall be 20 percent.

SECTION 5: SPECIFICATIONS

TECHNICAL SPECIFICATIONS

5. EARTHWORK

5.1 DEFINITIONS

5.2. The following terms shall have the meanings hereby assigned to them:-

5.3 "Topsoil" means any surface material, including turf, suitable for use in soiling areas to be grassed or cultivated.

5.4 "Excavation" Means excavation in open cut (excluding Trench Excavation) down to levels required as per approved Drawings or otherwise as being the general levels after completion of excavation.

5.5 EXPLOSIVES AND BLASTING-Deleted

5.6 CONTROLLED BLASTING-Deleted

5.7 ELECTRIC BLASTING- Deleted

5.8 MISFIRES-Deleted

5.9 SITE CLEARANCE

All area of the Site marked in the Specification Drawings for clearance or from which material is to be excavated or upon which filling is to be deposited shall be cleared to the extent required by the Engineer of all buildings, walls, gates, fence and other structures and obstructions and of all bushes, hedges, trees, stumps, roots and other vegetation except for trees marked for preservation. Material so cleared shall so far as suitable be preserved and stacked for further use but shall otherwise be disposed off the Site as directed by the Engineer.

5.10 TREES

Where directed by the Engineer trees shall be uprooted or cut down as near to ground level as possible. Branches and foliage shall be removed or disposed off the Site. Useful timber shall remain the property of the Corporation of Chennai and shall be cut into suitable lengths and transported a distance not exceeding five kilometres to a location designated by the Engineer where it shall be offloaded and stacked.

5.11 STUMPS

Stumps and roots whether existing or remaining after tree felling shall where directed by the Engineer be grubbed out and disposed off the Site. The resulting hole shall be filled with approved material deposited in 225 mm layers and compacted to the same dry density as the adjoining soil.

The contractor shall arrange to make trial pits at appropriate intervals to ascertain the underground services and to fix up Storm Water Drain alignments.

During execution of works if contractor causes damages to the under ground services like Metro Water pipe lines, TNEB, Chennai Telephones, Corporation Street Light Cable, and other OFC cables etc., it should be restored to its original condition by he contractor with at his own cost. Further if any damage charges claimed by the service departments will also be borne by the contractor. Chennai Corporation will be liable for such payments.

5.12 EXCAVATION IN HARD ROCK BY CHISELLING

a. This includes rock which is easily excavated by blasting, but due to close proximity of structures or any other reason that the Engineer may consider, will have to be excavated by chiselling.

b. The Contractor may resort to any of the following methods to excavate rock by chiselling :

(i) Wedging by means of crowbars, pick axes or pneumatic drills.

(ii) Heating and quenching.

(iii) Controlled blasting with a small charge just sufficient to make a crack in rock which will be subsequently removed by wedging

5.13 EXCESS EXCAVATION TO BE MADE GOOD

The Contractor shall, if directed, remove from the Site all material resulting from excess excavation and shall make good the same with such kind of fill material or in such class of concrete as may be reasonably required by the Engineer having regard to the circumstances.

5.14 STRIPPING TOP SOIL

Where ordered by the Engineer, topsoil shall be stripped to such depths and over such areas as he may direct, as a separate operation prior to any further excavation which may be required.

5.15 SUPPORTING EXCAVATIONS

a. The Contractor shall well and effectually support the sides and ends of all excavations to prevent any fall or run from any portion of the ground outside the excavation and to prevent settlement or damage to structures adjacent to the excavation. Any excavation necessary to provide space for such support or other working space shall be carried out. If, for any reason, any portion of the bottoms, sides or ends of any excavations shall give way, the Contractor shall at his own expense take all necessary remedial measures including the excavation and removal of all the ground thereby distributed.

b. Where the Contractor elects and is permitted by the Engineer to perform excavations with sloping faces (other than sloping excavations shown on the Drawings or required as permanent features of the Works) and without shoring, the excavated faces shall be to stable slopes and heights.

5.16 TRIMMING EXCAVATIONS-

a. When excavating to specified or required levels for the foundation of any structure or to specified or required limits for the face of any structure required to abut undisturbed ground, the Contractor shall not excavate the last 150 mm until immediately before commencing the constructional work, except where the Engineer shall permit otherwise. Should the Contractor have excavated to within 150 mm above these specified levels or to within 150 mm of these specified limits before he is ready or able to commence the constructional work he shall, where required by the Engineer, excavate further so as to remove not less than 150 mm of material immediately before commencing the constructional work.

b. Before commencement of any constructional work all shattered and loose materials shall be removed from the excavations by hand so as to ensure that the work rests on a solid and perfectly clean foundation or abuts against solid ground.

5.17 INSPECTION BY THE ENGINEER

a. When the specified levels or limits of excavation are reached the Engineer will inspect the ground exposed, and if he considers that any part of the ground is by its nature unsuitable he may direct the Contractor to excavate further. Such further excavation shall be refilled to the specified levels or limits with concrete, selected excavated material or selected imported material as directed by the Engineer.

b. Should the material forming the bottom of any excavation, while acceptable to the Engineer at the time of his inspection, subsequently become unacceptable to him due to exposure to weather conditions or due to flooding or have puddled, soft or loose during the progress of the works, the Contractor shall remove such damaged, softened or loosened material and excavate further by hand.

5.18 DISPOSING EXCAVATED MATERIAL

a. All excavated material shall remain the property of the Corporation of Chennai, but disposal of surplus excavated materials including rock should be carted & deposited &levelled by the contractor at the location specified by the Engineering in charge of Corporation of Chennai.

b. The Contractor shall ensure that no excavated material which is suitable for and is required for re-use in the Works is transported unless so ordered by the Engineer.

c. The term "excavation" shall be deemed to include for disposing excavated material within the Site in any of the following ways :

(i) back-filling to excavations and completed structures using suitable excavated material and including placing in temporary spoil tips and any double handling required all as specified hereafter,

or

(ii) transporting and placing approved excavated material in permanent spoil tips, as directed by the Engineer of Corporation of Chennai including the shaping and drainage of such tips all as specified hereafter,

or

(iii) Excavated earth/Silt/Debris shall be transported to the selected location as directed by the Departmental officers.

5.19 BACK-FILLING, GENERAL SITE GRADING & SAND FILLING-

a. **Fill Material**

(i) 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, the Engineer reserves the right to reject such material which in his opinion either does not meet the specification requirements or unsuitable for the purpose for which it is intended.

(ii) It shall be the 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 requested by the Engineer, the Contractor shall arrange to have trial pits of specified dimensions and numbers dug at locations specified, for the Engineer to examine the nature and type of material likely to be obtained from the borrow areas.

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

(iv) Roads, of a temporary nature, required to be constructed for access and for movement of men, materials, equipment, 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 the Contractor. Such access roads shall be maintained in good condition during all seasons to ensure completion of the work according to the time schedule.

b. **Backfilling**

(i) Excavated material used as backfilling to excavations or completed structures shall be free from rubbish, vegetation, clods and lumps and shall be approved by the Engineer. The approved materials shall be placed in layers, not exceeding 225 mm in depth before compaction and shall be compacted to a dry density not less than ninety-five percent of the maximum dry density obtained by the test in Part VII of I.S. 2720 or to such higher density as is specified hereinafter. During compaction the backfill shall have a uniform moisture content equal to or a little above the optimum moisture content recorded in the I.S. Compaction Test. Where necessary the Contractor shall adjust the moisture content of the backfill either by drying out or by adding water. After such drying out or adding of water the backfill shall be thoroughly mixed until the moisture content is uniform.

(ii) Soft material shall not be used as backfilling around structures in rock. The Contractor shall backfill such excess excavation with concrete, rubble, stone or rock fill as directed by the Engineer. Filling other than concrete shall be placed in layers not exceeding 225 mm in thickness, shall be thoroughly compacted and have adequate fines content to fill the voids.

(iii) Should the material being placed as backfilling, while acceptable at the time of selection, become unacceptable to the Engineer due to exposure to weather conditions or due to flooding or have become puddle, soft or segregated during the progress of the Works, the Contractor shall remove such damaged, softened or segregated material and replaced it with fresh approved material.

(iv) The Contractor shall when placing the backfilling make due allowance for any settlement that may occur before the end of the Defects Liability Period, remove any excess material or make up any deficiency by backfilling to the specified levels. As a rule, material to be backfilled shall be stacked temporarily within the basic lead of 300 meters unless otherwise directed by the Engineer.

(v) Compaction shall be carried out to achieve at least 95% of standard Proctor Dry Density at an optimum moisture content determined in accordance with the relevant I.S. Specification. It shall be ensured however that the minimum compacted dry density is not less than 1.6 T/cum. As the work progresses field density tests shall be conducted on each layer at the rate of one test for every 1000 square meters to check whether the desired compaction has actually been achieved.

c. **General site Grading**

(i) Site grading shall be carried out as directed by the Engineer. Excavation shall be carried out as specified in the specification. Filling and compaction shall be carried out as specified under (ii) of this Clause unless otherwise indicated below.

(ii) The approved material shall be placed in layers not exceeding 225 mm in depth before compaction and shall be compacted to a dry density not less than 95 percent of the maximum dry density obtained by the test in Part VII of IS 2720.

(iii) To ensure that the fill has been compacted as specified, field and laboratory tests shall be carried out by the Contractor.

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

(v) The Contractor shall protect the earth fill from being washed away by rain or damaged in any other way. Should any slip occur, the Contractor shall remove the affected materials and make good the slip.

(vi) The fill shall be carried out to such dimensions and levels as directed by the Engineer, after the stipulated compaction. The fill will be considered as incomplete if the desired compaction has not been obtained.

(vii) 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 the 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.

(viii) If so specified, the rock as obtained from the excavation may be used for filling and leveling to indicate grades without further breaking. In such event, filling shall be done in layers not exceeding 50 cms approximately. After rock filling to the approximate level indicated above has been carried out, the void in the rock fill shall be filled with finer materials such as earth, broken stone, etc. and the area flooded so that the finer materials fill up 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 material and earth shall be laid and consolidation carried out by a 12 tonne roller. Not less than twelve passes of the roller shall be accepted before subsequent similar operations are taken up.

d. **Sand filling below Plinth and other places:**

Backfilling shall be carried out with sand at places as directed by the 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 conditions shall be to the Contractor's account. The surface of the Consolidated sand shall be dressed to the required level or slope. Construction of floors or other structures on sand fill shall not be started until the Engineer has inspected and approved the fill.

5.20 LOCAL RULES AND REGULATIONS

a. The Contractor shall familiarise himself with the local rules and regulations governing the excavation, quarrying operations, etc. and the work shall be carried out strictly in accordance with rules and regulations, if any. Whenever a quarry is required to be opened in connection with the execution of work covered under this Contract, the Contractor shall investigate that it shall yield stones and other materials such as sand, moorum, soil, etc., of approved quality and shall satisfy himself as to the availability in desired quantity. He shall supply necessary quantity of sand, stone, metal aggregate, etc. to the Engineer for carrying out tests as desired by the Engineer and well in advance of its use so as to get approval to the quality of the material. The cost of opening and operating the quarry shall be borne entirely by the Contractor.

b. The Contractor shall obtain necessary permission from the concerned authorities before opening the quarry, in case of quarries in private land on payment of whatever charges as may be due to the owner. seignior age charges will be recovered from the contractors' bills as per the rates contained in G.O.No:331, dated: 26-6-2000 of Industries and Commerce (M-1) Department, a copy enclosed in Volume-4 of the Bid Documents. If any subsequent revision of the seignior age charges takes place during the tenure of the contract, the said extra amount also will be recovered from the contractors' bills and will be paid to the Mines & Geology Department. If there is any reduction in the seignior age charges mentioned in the above G.O. the differential amount also will be recovered from the contractors bills as per the G.O.No:331, dated: 21-6-2000 of Industries and Commerce (M-1) Department. The contractor shall note that seignior age surcharge will be deducted from his bills for the materials used on works at rates prescribed in G.O.Ms.NO.606, Dated 27-11-1986.

5.21 SPOIL TIPS ON THE SITE-

a. The limits of permanent spoil tips shall be ordered by the Engineer for landscaping purposes. Temporary spoil tips may be used to store excavated material as required and shall be arranged by the Contractor subject to the Engineer's approval having regard to any particular requirements of the Contract.

b. Only material which is approved by the Engineer shall be placed in the various spoil tips, topsoil being placed in separate spoil tips where so ordered. No tree trunks, stumps, roots, branches or rubbish of any kind shall be placed in spoil tips.

c. The Contractor shall form separate spoil tips of useful materials as follows:
(i) good quality rubble and hardcore,
(ii) khandkies and corner stones,
(iii) inferior quality rubble,
(iv) soft rock, earth and moorum,
(v) hard rock.

d. Permanent spoil tips shall be finished to shape as directed by the Engineer. Temporary spoil tips shall be so shaped as to maintain stability and good drainage at all times.

5.22 DISPOSAL OF EXCAVATED MATERIAL OFF SITE

Excavated material including rock which is not required for or is unsuitable for re-use in the works shall be disposed off by carting away to locations as directed by the Engineer of Corporation of Chennai. Such material shall remain the property of the Corporation of Chennai and shall be transported and deposited at places designated by the Engineer. Material so deposited shall be shaped up or spread and levelled as directed by the Engineer. Any necessary work to provide access to the Engineer's tips or other preliminary work in connection therewith shall be carried out by the Contractor to the approval of the Engineer. The quantity of earth work

to be transported depends on the amount of earth work involved based on the design for various units to be submitted by the contractor and hence quantity can not be indicated.

5.23 FIELD DRAINS IN GENERAL EXCAVATION

Should any existing sub-soil or field drains be uncovered during general excavation, the contractor shall either carefully replace them when back filling, or, if this is impracticable shall divert them to new drains or ditches, or otherwise re-lay them as the Engineer may direct.

5.24 DEWATERING

a. 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. The contractor shall remove by pumping or other means approved by Engineer any water inclusive of rain water and sub-soil 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 in any case, the pumping arrangement shall be such that there shall be no movement of sub-soil or blowing in due to differential head of water during pumping. Pumping arrangements shall be adequate to ensure no delays in construction.

b. When there is a continuous inflow of water and the quantum of water to be handled is large in the opinion of the Engineer, the well point system single stage, or multi stage, shall be adopted. The contractor shall submit to the Engineer his scheme of the well point system including the stages, the spacing, number and diameter of well points, headers etc., and the number, capacity and location of pumps for approval.

5.25. TIMBER SHORING-

a. Close timbering shall be done by completely covering the sites of the trenches and pits generally with short, upright members called 'polling boards'. 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 walling of strong wood at maximum 1.2 mtrs., spacing and suitably strutted. If the soil is very soft and loose, the boards shall be placed horizontally against each side of the excavation and supported by vertical walling, 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.

b. The shoring material shall not be sizes less than those specified below unless steel sheet piling is used or unless otherwise approved by the Engineer in writing:

a)	Planks	-	5 cm x 25 cm
b)	Waling pieces	-	10 cm x 20 cm
c)	Struts	-	15 cm x 20 cm

c. 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 the Contractor to take all necessary steps to prevent the sides of excavations, trenches, pits, etc., from collapsing.

d. 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 the Engineer.

e. 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 can not be retrieved.

f. 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 5 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 the Engineer. In all other respects, the specification for close timbering shall apply to open timbering.

g. 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 across 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.

5.26 TRIAL PITS OR TRENCHES

a. The Engineer may direct that trial pits or trenches shall be excavated well ahead of the trench excavation to such depths as he shall order to determine the alignment for the trench.

b. Any further trial pits or trenches required by the Contractor to determine the position of underground services, sub-soil drains or for any other reason shall be excavated and reinstated at the Contractor's expense.

c. The Contractor shall arrange for the refilling and reinstatement of trial pits or trenches to be carried out immediately after the required information is obtained. The reinstatement of the surfaces of trial pits or trenches shall be carried out to the approval of the Engineer.

5.27 TRENCH EXCAVATION IN ROADS AND FOOTPATHS

a. All Trench Excavation and other work carried out within the limits of any road shall be completed as rapidly as possible and not more than half of the width of the carriageway shall be obstructed at one time. Road drains etc shall be kept free from obstruction. In any event the Contractor shall take special precautions, which shall include the continuous support of the sides of the excavation, from the time when excavation is begun until the refilling of the trench is placed, to ensure that there is no disturbance of the adjacent road or foundation.

b. Where excavated material has temporarily been deposited on a grass margin or road pavement, the margin or road pavement shall on completion of refilling be restored entirely to its original condition and left free from loose stones.

5.28 TRENCHES NOT TO BE LEFT OPEN

a. Trench Excavation shall be carried out expeditiously and, subject to any specific requirements of the Contract, the refilling and surface reinstatement of Trench Excavations shall be commenced and completed as soon as reasonably practicable after the pipes have been laid and jointed.

b. Pipe laying shall follow closely upon the progress of Trench Excavation, and the Contractor shall not permit unreasonably excessive lengths of Trench Excavation to remain open while awaiting testing of the pipeline. The Contractor shall take precautions to prevent flotation of pipes in occasions where open Trench Excavations may become flooded, and these precautions may include the partial refilling of the trench leaving pipe joints exposed while awaiting tests of the joints.

c. 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 Trench Excavations.

5.29 REFILLING OF TRENCH EXCAVATIONS

a. Trench Excavations shall be refilled using suitable materials selected from excavations carried out at site or suitable borrow areas as directed by the Engineer.

b. Soft Material (free from stones greater than 75 mm in size for pipes without bitumen sheathing and 20 mm in size for pipes with bitumen sheathing) shall be deposited in 150 mm layers and thoroughly rammed with rammers working alternately on either side of the pipe (particular care being taken to avoid damage to the pipe and any sheathing) until the trench has been refilled up to the crown of the pipe, and thereafter until the soft filling has been carried up at least 300 mm above the top of the pipe.

c. The remainder of the refilling may consist of coarse material (including broken rock from excavation in Hard Rock) free from boulders and clods of earth larger than 150 mm in size provided that the compacted backfill is, in the opinion of the Engineer sufficiently dense to prevent material from the superimposed layers being washed into the voids in such backfill. This coarse material shall be spread in layers of not greater depth than 225 mm and be thoroughly rammed by an approved mechanical rammer. The coarse filling is to be carried up to the level at which (in roads and footpaths) surface reinstatement is to commence or (elsewhere)

to such level as with the surface reinstatement of the whole of the topsoil will leave the finished work sufficiently "proud" to allow for future settlement to the original ground level.

d. Hard material such as broken rock and original road metaling shall normally be used only for the surface reinstatement of roads as specified but where it is suitable and available in sufficient quantity it may be used in place of or as well as the aforesaid coarse material.

e. Where necessary, the Contractor shall adjust the moisture content of the refill material either by drying out or by adding water to assist the compaction of the material.

f. Should the material being placed as refilling, while acceptable at the time when approved, become unacceptable to the Engineer due to exposure to weather conditions or due to flooding or have become puddled, soft or segregated during the progress of the Works, the Contractor shall at his own expense remove such damaged, softened or segregated material and replace it with fresh approved material. Where directed by the Engineer trench excavations shall be refilled with concrete.

5.30 EXISTING SERVICE

a. Where Trench Excavation is carried out close to or across the line of sewers, pipes , cables and other services, the Contractor shall, where necessary, provide temporary supports or slings and where such sewer, pipe, cable or other service is disturbed it shall be replaced.

b. Where, in the opinion of the Engineer, construction of the pipeline cannot reasonably be carried out unless the sewer, pipe, cable or other service is permanently severed or permanently diverted or permanently supported by concrete, he shall order the Contractor to undertake such work.

c. Notwithstanding any relevant information furnished by the Engineer, the Contractor shall be responsible for ascertaining from his own inspection of the Site and from the respective supply authorities and other public bodies the position of all mains, pipes and cables whether underground or overhead, within or near the Site.

5.31 HEDGES,FENCES AND WALLS

a. Where the Trench Excavation crosses barriers such as hedges, fences and walls, the Contractor, as a temporary measure during construction of the pipeline, shall provide temporary fencing for any parts of such barriers as have had to be removed.

b. After Trench Excavation has been reinstated, the Contractor shall carry out such work as the Engineer may order for permanent restoration of such barriers.

5.32 CROSSING WATERCOURSES, ETC.

a. Where the pipeline crosses rivers, culverts and other watercourses, the Contractor shall be deemed to have allowed for all the additional measures necessary for the proper construction of the pipeline at these crossings including maintaining the full flow of water across the trench.

5.33 Demolition: .

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

(a) No electric cable or apparatus which is liable to be source of danger over cable or apparatus used by the operator shall remain electrically charged.

(b) All practical steps shall be taken to prevent danger persons employed from risk of any damages to the under ground services like Metro Water pipe lines, TNEB, Chennai Telephones, Corporation Street Light Cable, and other OFC cables etc.,

CONCRETE AND ALLIED WORKS

5.34 GENERAL

a. The quality of materials and method and control of manufacture and transportation of all concrete work irrespective of mix, whether reinforced or otherwise, shall conform to the applicable portions of this specification.

b. The Engineer shall have the right to inspect the source/s of material/s, the layout and operation of procurement 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.

5.35 MATERIALS FOR STANDARD CONCRETE

a. The ingredients to be used in the manufacture of concrete shall consist solely of Portland cement , clean sand, natural coarse aggregate, clean water, and admixtures, if specifically called for on conditions at site warrant its use.

b. Cement

(i) Unless otherwise specified in the Specification or called for by the Engineer, cement shall be ordinary Portland cement in 50 kg. bags. The use of bulk cement will be permitted only with the approval of the Engineer. Changing of brands or type of cement within the same structure should be avoided as far as possible.

(ii) The Contractor will have to make his own arrangements for procurement and storage of adequate quantity of cement. Cement in bulk may be stored in bins or silos which will provide complete protection from dampness, contamination and minimize caking and false set. Cement bags shall be stored in a dry enclosed shed (storage under tarpaulins will not be permitted), well away from the outer walls and insulated from the floor to avoid contact with moisture from the ground and so arranged as to provide ready access. Damaged or reclaimed or partly set cement will not be permitted to be used and shall be removed from the Site. The storage bins and storage arrangements shall be such that there is no dead storage. Not more than 12 bags shall be stacked in any tier. The storage arrangement shall be approved by the Engineer. Consignments of cement shall be stored as received and shall be consumed in the order of their delivery.

(iii) Cement held in storage for a period of ninety (90) days or longer shall be tested. Should at any time the Engineer have reasons to consider that any cement is defective, then irrespective of its origin. date of manufacture and /or manufacturer's test certificate, such cement shall be tested immediately at the Contractor's cost at an approved laboratory and until the results of such tests are found satisfactory, it shall not be used in any work. The Contractor shall not be entitled to any claim of any nature on this account.

c. Aggregates

(i) General

A "Aggregate" in general designates both fine and coarse inert materials used in the manufacture of concrete.

B "Fine Aggregate" is aggregate most of which is retained on 4.75 mm IS sieve.

C "Coarse Aggregate" is aggregate most of which is passed through on 4.75 mm IS sieve.

D All fine and coarse aggregates proposed for use in the Works shall be subject to the Engineer'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.

E Aggregates shall, except as noted above, consist of natural sands, crushed stone from a source known to produce satisfactory aggregate for concrete and shall be chemically inert, strong, hard, durable against weathering, of 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.

(ii) Sampling and Testing

A. Samples of the aggregates for mix design and determination of suitability shall be taken under the supervision of Engineer 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 advance or the work for use in determining aggregate suitability. The costs of all such tests, sampling, etc., shall be borne by Contractor.

(iii) Storage of aggregates: 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 aggregate 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 used for lifting the coarse aggregates from bins or stock piles. Coarse aggregate shall be piled in layers not exceeding 1.20 meters in height to prevent coning or segregation. Each layer shall cover the entire area of the stock pile before succeeding layers are started. Aggregates that have become segregated shall be rejected. Rejected material after remixing may be accepted, if subsequent tests demonstrate conformance with required gradation.

(iv) Specific Gravity: Aggregates having a specific gravity below 2.6 (saturated surface dry basis) shall not be used without special permission of the Engineer.

5.36 FINE AGGREGATE

a. Fine aggregate shall consist of natural or crushed sand conforming to IS 383. 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.

(i) Machine-made Sand: Machine-made sand will be acceptable, provided the constituent rock-gravel composition shall be sound, hard, dense, non-organic, uncoated and durable against weathering.

(ii) 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 fractions.

(iii) Foreign Material Limitations: The percentage of deleterious substances in sand delivered to the mixer shall not exceed the following :

	Percent by weight	
	Uncrushed	Crushed
(A) Material finer than 75 micron I.S. Sieve	3.00	15.00
(B) Shale	1.00	1.00
(C) Coal and lignite	1.00	1.00
(D) Clay lumps		
(E) Total of all above substances including items (i) to (iv) for uncrushed sand and items (iii) and (iv) for crushe	5.00	2.00

b. Gradation

(i) Unless otherwise directed or approved by the Engineer, the grading of sand shall be within the limits indicated hereunder :

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

(ii) Where the grading falls outside the limits of any particular grading zone of sieves, other than 600 micron I.S sieve, by total amount not exceeding 5 percent, it shall be regarded as falling within that grading zone. This tolerance, shall not be applied to percentage passing the 600 micron I.S. sieve or to percentage passing any other sieve size 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.

c. 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 I.S. sieve sizes (4.75 mm, 2.36 mm, 1.18 mm, 600 micron, 300 micron and 150 micron) and dividing the sum by 100.

5.37 COARSE AGGREGATE

a. Coarse aggregate for concrete, except as noted above, shall conform to I.S. 383. 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.

b. 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.

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

IS Sieve Designation	Percentage passing for single-sized aggregate of nominal size.				Percentage passing for graded aggregate of nominal size			
	40mm	20mm	12.5mm	10mm	40mm	20mm	12.5mm	
63mm	100	-	-	-	100	-	-	
40mm	85-100	100	-	-	95-100	100	-	
20mm	0-20		85-100	-	30-70	95- 100		
16mm -	-	100	-	-	-	-	-	
12.5mm	-	-	85-100	100		-	-	95-100
10 mm	0-5	0-20	0-45	85-100	10-35	25-55	40-85	
4.75 mm	-	-	0-5	0-10	0-45	0-5	0-10	0-10
2.36 -	-	-	-		0-5		-	-

d. The pieces shall be angular in shape and shall have granular or crystalline surfaces. Friable, flaky and laminated pieces, mica and shale, if present, shall be only in such quantities that will not, in the opinion of Engineer, affect adversely the strength and/or durability of concrete. The maximum size of coarse aggregate shall be 40mm for M-10 concrete and 20 mm for M-15 to M-40 concrete, or as directed by the Engineer or specified otherwise. The maximum size of coarse aggregate shall be the maximum size specified above, but in no case greater than 1/4 of the minimum thickness of the member, provided that the concrete can be placed without

difficulty so as to surround all reinforcement 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 to reinforcement whichever is smaller. The amount of fine particles occurring in the free state or as loose adherent shall not exceed 1% when determined by laboratory sedimentation tests as per I.S. 2386. After 24 hours immersion in water, a previously dried sample shall not have gained more than 10% of its oven dry weight in air, as determined by I.S. 2386.

e. Foreign Material Limitations: The percentage of deleterious materials in the aggregate delivered to the mixer shall not exceed the following :

	Foreign Material	Percent by weight	
		Uncrushed	Crushed
i)	Material finer than 75 micron I.S. Sieve	3.00	3.00
ii)	Coal and Lignite	1.00	1.00
iii)	Clay lumps	1.00	1.00
iv)	Soft Fragments	3.00	--
v)	Total of all the above substances	5.00	5.00

5.38 WATER

a. Water used for washing, mixing and curing shall be free from injurious amounts of deleterious materials. Potable water is generally satisfactory for mixing and curing concrete.

b. In case of doubt, the suitability of water for making concrete shall be ascertained by the compressive strength and initial setting time test specified in IS 456. The sample of water taken for testing shall be typical of the water proposed to be used for concreting, due account being paid to seasonal variation. The sample shall not receive any treatment before testing other than that envisaged in the regular supply of water proposed for use in concrete. The sample shall be stored in a clean container previously rinsed out with similar water.

c. Average 28 days compressive strength of at least three 15 cm concrete cubes prepared with water proposed to be used shall not be less than 90% of the average strength of three similar concrete cubes prepared with distilled water. The cubes shall be prepared, cured and tested in accordance with the requirements of IS 516.

d. The initial setting time of test block made with the appropriate test cement and the water proposed to be used shall not be less than 30 minutes and shall not differ by more than $\pm$30 minutes from the initial setting time of control test block prepared with the appropriate test cement and distilled water. The test blocks shall be prepared and tested in accordance with the requirements of IS 4031.

e. Where water can be shown to contain an excess of acid, alkali, sugar or salt, Engineer will refuse to permit its use. As a guide, the following concentrations represent the maximum permissible values :

i) To neutralize 200 ml. sample of water, using phenolphthalein as indicator, it should not require more than 2 ml. of 0.1 Normal NaOH. The details of test shall be as given in IS 3025.

ii) To neutralize 200 ml. sample of water, using methyl orange as an indicator, it should not require more than 10ml. of 0.1 Normal HCl. The details of test shall be as given in IS 3025.

f) Percentage of solids, when tested in accordance with the method indicated below shall not exceed the following :

Solids	Percent	Method of test (Ref. to Clause No: in IS 3025)
Organic	0.02	10 and 11 (organic solid = total solids minus ignited residue)
Inorganic	0.30	11 (Ignited residue)
Sulphates (as So4)	0.05	20
Alkali Chlorides (as C1)	0.20	24
Suspended matter	0.20	12

g) The pH value of water shall not generally be less than 6.

5.39 STEEL MEMBERS ENCASED IN CONCRETE

Structural steel columns, beams, girders and bracings to be encased in concrete shall be unpainted. The encasing shall be done in concrete with 10 mm maximum size aggregate and a works cube strength not less than 150 kg/cm² at 28 days unless otherwise specified. The steel member shall be wrapped with galvanized wire mesh of adequate size. The galvanized wire mesh shall be kept 20 mm from the edge or surface of the steel member and shall be held in position securely. The Steel member will have a minimum cover of 50 mm unless otherwise indicated in the drawings. Where the clear cover to steel is more than 75 mm, mild steel bar and concrete with 20 mm coarse aggregate can be used.

5.40 REINFORCED CEMENT CONCRETE

Reinforced Cement Concrete in the Works shall be "Design Mix Concrete" as defined in IS 456/2000, for M20 and M30 grades. Nominal mix concrete may be used for concrete of lower grades i.e. lower than M20 grade concrete.

5.40.1 The specified characteristic compressive strength of 150 mm size cube at 28 days attained for M20 grade concrete shall be 20 N/sqmm and for M25 grade concrete shall be 25 N/sqmm respectively. The contractor is required to carryout the mix design and the mix so designed need to be got approved by the concerned Executive Engineer, Projects Division, Corporation of Chennai within the limitations of parameters and other stipulations laid down in IS-456/2000. The mix shall be designed to produce the grade of concrete having the required workability and a characteristic strength at 28 days not less than the appropriate values mentioned in Table-2 of IS-456/2000 i.e. 20 N/sqmm for M20 grade concrete and 25N/sqmm for M25 grade concrete respectively. The target mean strength of the concrete mix should be equal to the characteristic strength plus 1.65 times the standard deviation.

5.40.2 IS-3370 (Part-I), 1965, prescribes that the minimum quantity of cement used for the reinforced concrete work in the case of water retaining structures shall not be less than 330 Kg/cum. IS-456/2000 prescribes the minimum cement quantity to be used for M20 grade reinforced cement concrete as 300 Kg/cum and M30 grade reinforced cement concrete as 320 Kg/cum respectively. The Ministry of Surface Transport (MOST) specifications prescribes quantity of cement to be used in the case of M20 grade reinforced cement concrete 380 Kg/cum, M25 grade reinforced cement concrete 400 Kg/cum and in the case of M30 grade reinforced cement concrete as 420 Kg/cum. In the preparation of estimates for this work, in the data the said quantities of cement as prescribed by MOST and as approved by Government vide G.O.Ms.No.30, dt: 19-3-2002, Irrigation & CAD Department (Projects Wing: COD), has been adopted. The contractor shall use the quantities of cement at site during execution of reinforced cement concrete work by design mix not less than as adopted in the detailed estimates i.e. in the case of M20 grade reinforced cement concrete 380 Kg/cum, M25 grade reinforced cement concrete 400 Kg/cum and in the case of M30 grade reinforced cement concrete 420 Kg/cum and shall use even more cement in above cases if required for attaining not less than the prescribed specified characteristic compressive strength of 150 mm cubes at 28 days i.e. 20 N/sq mm for M20 grade concrete, 25 N/sq mm for M25 grade concrete and 30 N/sq mm for M30 grade concrete respectively, without any extra cost.

5.41 MIX DESIGN

a. General

(i) This is to investigate the grading of aggregates, water-cement ratio, workability and the quality of cement required to give preliminary and works cubes of the minimum strength specified. The proportions of the mix shall be determined by weight. Adjustment of aggregate proportions due to moisture present in the aggregate shall be made. Determination of mix proportions shall be carried out according to `Recommended guidelines for Concrete Mix Design' conforming to IS 10262.

(ii) Whenever there is a change either in required strength of concrete, or water-cement ratio or workability or the source of aggregates and/or cement, preliminary tests shall be repeated to determine the revised proportions of the mix to suit the altered conditions. While designing mix proportions, over-wet mixes shall always be avoided.

(iii) While fixing the value for water/cement ratio for preliminary mixes, assistance may be derived from the graph (Appendix A, IS 456 showing the relationship between the 28-day compressive strengths of concrete mixes with different water/cement ratios and the 7-day compressive strength of cement tested in accordance with IS 269.

b. Preliminary Tests

(i) Test specimens shall be prepared with at least two different water/cement ratios for each class of concrete, consistent with workability required for the nature of the work. The materials and proportions used in making preliminary tests shall be similar in all respects to those to be actually employed in the works as the object of these tests is to determine the properties of cement, aggregates and water necessary to produce concrete of required consistency and to give the specified strength. It will be Contractor's sole responsibility to carry out these tests and he shall therefore furnish to Engineer a statement of proportions proposed to be used for the various concrete mixes. For preliminary tests, the following procedure shall be followed:

(A) Materials shall be brought to the room temperature and all materials shall be in a dry condition. The quantities of water, cement and aggregates for each batch shall be determined by weight to an accuracy of 1 part in 1000 parts.

(B) Mixing Concrete: It shall be done by hand or in a small batch mixer as per IS 516 in such a manner as to avoid loss of water. The cement and fine aggregate shall first be mixed dry until the mixture is uniform in colour. The coarse aggregate shall then be added, mixed and water added and the whole batch mixed thoroughly for a period of not less than two minutes until the resulting concrete is uniform in appearance. Each batch of concrete shall be of such a size as to leave about 10% excess concrete, after moulding the desired number of test specimens.

(C) Consistency: The consistency of each batch of concrete shall be measured immediately after mixing, by the slump test in accordance with IS.1199. If in the slump test, care is taken to ensure that no water or other material is lost, the material used for the slump test may be remixed with the remainder of the concrete for making the specimen test cubes. The period of re-mixing shall be as short as possible yet sufficient to produce a homogeneous mass.

(D) Size of Test Cubes: Compression tests of concrete cubes shall be made as per IS.516 on 15 cm cubes. Each mould shall be provided with a metal base plate having a plate surface so as to support the mould during filling without leakage. The base plate shall be preferably attached to the mould by springs or screws. The parts of the mould when assembled shall be positively and rigidly held together. Before placing concrete, the mould and base plate shall be cleaned and oiled. The dimensions and internal faces of the mould shall be accurate within the following limits:

(1) Height and distance between the opposite faces of the mould shall be of specified size ±0.2 mm. The angle between the adjacent internal faces and between internal faces and top and bottom faces of mould shall be 90 o ± 0.5 o. The interior faces of the mould shall be plane surfaces with a permissible variation of 0.03 mm.

(E) Compacting: Concrete test cubes shall be moulded by placing fresh concrete in the mould and compacted as specified in IS.516.

(F) Curing: Curing shall be as specified in IS.516. The cubes shall be kept in moist air of at least 90% relative humidity at a temperature of 27 o C. ± 2 o C. for 24 hours ± 2 hour from the time of adding water to the dry ingredients. Thereafter they shall be removed from the moulds and kept immersed in clean, fresh water and kept at 27 o C. ± 2 o C. temperature until required for test. Curing water shall be renewed every seven days. A record of maximum and minimum temperatures at the place of storage of the cubes shall be maintained during the period they remain in storage.

(G) Testing of Specimens: The strength shall be determined based on not less than five cube test specimens for each age and each water cement ratio. All these laboratory test results shall be tabulated and furnished to the Engineer. The test results shall be accepted by the Engineer if the average compressive strengths of the specimens tested is not less than the compressive strength specified for the age at which specimens are tested subject to the condition that only one out of the five consecutive tests may give a value less than the specified strength for that age. The Engineer may direct the Contractor to repeat the tests if the results are not satisfactory and also make such changes as he considers necessary to meet the requirements specified. All these preliminary tests shall be conducted by the Contractor at his own cost in an approved laboratory.

5.42. PROPORTIONING, CONSISTENCY, BATCHING AND MIXING OF CONCRETE

a. Proportioning

(i) Aggregate

The proportions which shall be decided by conducting preliminary tests shall be by weight. These proportions of Cement, fine and coarse aggregates shall be maintained during subsequent concrete batching by means of weigh batchers conforming to IS.2722 capable of controlling the weights within one percent of the desired value. Except where it can be shown to the satisfaction of the Engineer that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions. The different sizes shall be stocked in separate stock piles. The grading of coarse and fine aggregate shall be checked as frequently as possible, as determined by the Engineer, to ensure maintaining of grading in accordance with the samples used in preliminary mix design. The material shall be stock piled well in advance of use.

(ii) Cement shall be measured by weight.

(iii) Water: Only such quantity of water shall be added to the cement and aggregates in the concrete mix as to ensure dense concrete, specified surface finish, satisfactory workability, consistent with the strength stipulated for each class of concrete. The water added to the mix shall be such as not to cause segregation of materials or the collection of excessive free water on the surface of the concrete.

(iv) Definition of Water/Cement Ratio:The water cement (W/C) ratio is defined as the weight of water in the mix (including the surface moisture of the aggregates) divided by the weight of cement in the mix.

(v) Water/Cement Ratio: The actual water cement ratio to be adopted shall be determined in each instance by the Contractor and approved by the Engineer.

(vi) Proportioning by Water/Cement Ratio: The W/C ratio specified for use by the Engineer shall be maintained. The Contractor shall determine the water content of the aggregates as frequently as directed by the Engineer as the work progresses and as specified in IS.2386 (Part III) and the amount of mixing water added at the mixer shall be adjusted as directed by the Engineer so as to maintain the specified W/C Ratio. To

allow for the variation in weight of aggregates due to variation in their moisture content, suitable adjustments in the weights of aggregates shall also be made.

b. Consistency and Slump

(i) Concrete shall be of a consistency and workability suitable for the conditions of the job. After the amount of water required is determined, the consistency of the mix shall be maintained throughout the progress of the corresponding parts of the work and approved tests e.g. slump tests, compacting factor tests, in accordance with IS.1199, shall be conducted from time to time to ensure the maintenance of such consistency.

(ii) The following tabulation gives a range of slumps which shall generally be used for various types of construction unless otherwise instructed by the Engineer:

SLUMPS FOR VARIOUS TYPES OF CONSTRUCTION

Placing Conditions (1)	O of Workability (2)	Slump (mm) (3)
Blinging concrete; Shallow sections; Pavements using pavers	Very low	In the 'very low' category of workability where strict control is necessary, for example pavement quality concrete, measurement of workability by determination of compacting factor will be more appropriate than slump *(see IS 1199)* and a value of compacting factor of 0.75 to 0.80 suggested.
Mass concrete; Lightly reinforced sections in slabs, beams, walls, columns; Floors; Hand placed pavements; Canal lining; Strip footings	Low	25 – 75
Heavily reinforced sections in slabs, beams, walls,	Medium	50 – 100
Slipform work; Pumped concrete		75 – 100
Trecnch fill; In-situ piling	High	100 – 150
Tremie concrete	Very high	In the 'very high' category of workability, measurement of workability by determination of flow will be appropriate *(see IS 9103)*

c. Batching and Mixing of Concrete

(i) The materials and proportions of concrete materials as established by the preliminary tests for the mix designs shall be rigidly followed for all concrete on the Works and shall not be changed except when specifically permitted by the Engineer.

(ii) Concrete shall be produced only by weigh batching the ingredients. The mixer and weigh batchers shall be maintained in clean, serviceable condition. The accuracy of weigh batchers shall be periodically checked. They shall be set up level on a firm base and the hopper shall be loaded evenly. The needle shall be adjusted to zero when the hopper is empty. Fine and coarse aggregates shall be weighed separately. Volume batching will not be permitted. However, the Engineer may permit volume batching by subsequent conversion of the weights of the aggregate into their equivalent volumes knowing their bulk densities, only in the case of small and less important pours involving concrete of not more than 0.25 cubic metres, on days when other pours involving weigh batching are not likely to be taken up. Concrete shall be of strength

stipulated in the respective items. All concrete shall be mixed in mechanically operated batch mixers complying with IS:1791 and of the approved make with suitable provision for correctly controlling the water delivered to the drum. The quantity of water actually entering the drum shall be checked with the reading of the size or valve setting, when starting a job. The test should be made while the mixer is running. The volume of the mixed material shall not exceed the manufacturer's rated mixer capacity. The batch shall be charged into the mixer so that some water will enter the drum in advance of cement and aggregates. All water shall be in the drum by the end of the first 15 seconds of the specified mixing time. Each batch shall be mixed until the concrete is uniform in colour, for a minimum period of two minutes after all the materials and water are in the drum. The entire contents of the drum shall be discharged in one operation before the raw materials for the succeeding batches are fed into the drum.

(iii) Each time the work stops, the mixer shall be cleaned out and when next commencing the mixing, the first batch shall have 10% additional cement to allow for sticking in the drum.

5.43 SAMPLING AND TESTING CONCRETE IN THE FIELD

All tests as specified in the relevant codes to be carried by the contractor in presence of Engineer in charge/Third party QAQC personnel.

a. Facilities required for sampling materials and concrete in the field, if the Engineer/ QAQC Technical personnel so desires, shall be provided by the Contractor at no extra cost. The equipments (Listed in annexure 1) with operator shall be made available at the Engineer's/ QAQC Technical personnel request (all must be in serviceable condition.) and with valid calibration certificates for the devices to be used for testing.)

b. No concrete of any kind may be placed until the field concrete testing laboratory as specified is provided to the satisfaction of the Engineer/QAQC personnel. The Contractor shall notify the Engineer in advance of all concrete and concrete material testing as provided in the Clause to provide the Engineer / his representative with an opportunity to witness all prescribed tests.
The third party QAQC agency appointed by the Corporation of Chennai shall be permitted to use the contractors lab to perform all the tests pertaining to the contract and behalf of Corporation of Chennai.

c. Sampling for Strength of Concrete: A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested that is, the sampling should be spread over the entire period of concreting and cover all mixing units.

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

Quantity of Concrete in the Work, m3	Number of samples
1 – 5	1
6 – 15	2
16 – 30	3
31 – 50	4
51 and above	4 plus one additional sample for each additional 50 m3 or part thereof.

Note: At least one sample shall be taken from each shift. Where concrete is produced at continuous production unit, such as ready-mixed concrete plant, frequency of sampling may be agreed upon mutually by suppliers and purchasers.

Three test specimens shall be made for each sample for testing at 28 days. Additional samples may be required for various purposes such as to determine the strength of concrete at 7 days or at the time of striking the formwork, or to determine the duration of curing, or to check the testing error. Additional samples may also be required for testing samples cured by accelerated methods as described in relevant IS code. The specimen shall be tested as described in relevant IS code.

The laboratory test results shall be tabulated and furnished to the Engineer. The test results of the sample shall be the average of the strength of three specimens. The individual variation should not be more than 15 percent of the average. If more, the test results of the sample are invalid.

d. Consistency: Slump tests shall be carried out as often as requested by the Engineer and invariably from the same batch of concrete from which the test cubes are made. Slump tests shall be done immediately after sampling.

5.44 OTHER TESTS

a.(i) If the work cubes do not give the required strengths, the Engineer reserves the right to ask the Contractor to dismantle such portions of the work which in his opinion are unacceptable and re-do the work to the standard required at the Contractor's cost.

(ii) The following tests shall be conducted whenever the required to be strength achieved on cement, sand, coarse aggregate, water in accordance with the relevant Indian Standards. Tests on cement shall include (i) fineness test, (ii) test for normal consistency, (iii) test for setting time, (iv) test for soundness, (v) test for tensile strength , (vi) test for compressive strength, (vii) test for heat of hydration (by experiment and by calculations) in accordance with I.S. 269. Tests on sand shall include (i) sieve test, (ii) test for organic impurities, (iii) decantation test for determining clay and silt content, (iv) specific gravity test, (v) test for unit weight and bulk age factor, (vi) test for sieve analysis and fineness modulus. Tests on coarse aggregate shall include (i) sieve analysis, (ii) specific gravity and unit weight of dry, loose and rodded aggregate, (iii) soundness and alkali aggregate reactivity, (iv) petrography examination, (v) deleterious materials and organic impurities, (vi) test for aggregate crushing value.

b. Load Test on Members or any other Tests

(i) In the event of any work being suspected of material or workmanship or both, the Engineer requiring its removal and reconstruction may order, or the Contractor may request that it should be load tested in accordance with the following provisions:

(ii) The test load shall be 125 percent of the maximum superimposed load for which the structure was designed. Such test load shall not be applied before 56 days after the effective hardening of concrete. During the test, struts strong enough to take the whole load shall be placed in position leaving a gap under the members, The test load shall be maintained for 24 hours before removal.

(iii) If within 24 hours of the removal of the load, the structure does not show a recovery of at least 75 percent of the maximum deflection shown during the 24 hours under load, the test loading shall be repeated after a lapse of at least 72 hours, The structure shall be considered to have failed to pass the test if the recovery after the second test is not at least 75 percent of the maximum deflection shown during the second test. If the structure is certified as failed by the Engineer, the cost of the load test shall be borne by the Contractor.

(iv) Any other tests, e.g. taking out in an approved manner concrete cores, examination and tests on such cores removed from such parts of the structure as directed by the Engineer, sonic testing, etc., shall be carried out by the Contractor, if so directed, at no extra cost.

c. Unsatisfactory Tests: Should the results of any test prove unsatisfactory, or the structure shows signs of weakness, undue deflection or faulty construction, the Contractor shall remove and rebuild the member or members involved or carry out such other remedial measures as may be required by the Engineer, without any additional cost.

5.45 ADMIXTURES

a. General: Admixtures may be used in concrete where required, only with the approval of the Engineer based upon evidence that, with the passage of time, neither the compressive strength nor its durability reduced. 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 to be used, such as in mass concrete works, it shall be dissolved in water and added to the mixing water in an amount not to exceed 1.5 percent of the weight of the cement in each batch of concrete. When admixtures are used, the designed concrete mix shall be corrected accordingly. Admixtures shall be used as per manufacturer's instruction and in the manner and with the control specified by the Engineer.

b. Air Entraining Agents: Neutralized vinsol resin or other approved air entraining agent may be used to produce the specified amount of air in the concrete mix and these agents shall conform to the requirements of ASTM standard 6-260; Air Entraining Admixtures for Concrete. The recommended total air content of the concrete is 4% ± 1%. The method of measuring air content shall be as per I.S. 1199

c. Water Reducing Admixtures: Water reducing lingo sultanate admixture may be added in quantities approved by the Engineer. The admixtures shall be added in the form of a solution.

d. Retarding Admixtures: Retarding agents may be added to the concrete mix in quantities approved by the Engineer.

e. Water-proofing Agent: Water proofing agents shall conform to I.S.2645.

f. Other Admixtures: The Engineer may at his discretion allow the Contractor to use any other admixture in the concrete.

5.46 PREPARATION PRIOR TO CONCRETE PLACEMENT, FINAL INSPECTION AND APPROVAL

a. Before the concrete is actually placed in position, the insides of the formwork shall be inspected to see that they have been cleaned and oiled. Temporary openings shall be provided to facilitate inspection, especially of bottoms of columns and wall forms, to permit removal of sawdust, wood shavings, binding wire, dirt, etc. Openings shall be placed or holes drilled so that these materials and water can be removed easily. Such openings/holes shall be suitably plugged later.

b. The various trades shall be permitted ample time to install drainage and plumbing lines, floor and trench drains, conduits, hangers, anchors, inserts, sleeves, bolts, frames and other miscellaneous embodiments to be cast in the concrete as specified or required or as is necessary for the proper execution of the work.

c. All embedded parts, inserts, etc., supplied by the Corporation of Chennai or the Contractor shall be correctly positioned and securely held in the forms to prevent displacement during depositing and vibrating of concrete.

d. All anchor bolts shall be positioned and kept in place with the help of properly manufactured templates unless specifically waived in writing by the Engineer.

e. Slots, openings, holes, pockets, etc., shall be provided in the concrete work in the positions specified or required or as directed by the Engineer.

f. Reinforcement and other items to be cast in concrete shall have clean surfaces that will not impair bond.

g. Prior to concrete placement, all work shall be inspected and approved by the Engineer and if found unsatisfactory, concrete shall not be poured until after all defects have been corrected.

h. Approval by the Engineer of any and all materials and work as required herein shall not relieve the Contractor from his obligation to produce finished concrete in accordance with the requirements of the Specifications.

j. Rain or Wash Water: No concrete shall be placed in wet weather or on a water-covered surface. Any concrete that has been washed by heavy rains shall be entirely removed, if there is any sign of cement and sand having been washed away from the concrete mixture. To guard against damage which may be caused by rains, the works shall be covered with tarpaulins immediately after the concrete has been placed and compacted before leaving the work unattended. Any water accumulating on the surface of the newly placed concrete shall be removed by approved means and no further concrete shall be placed thereon until such water is removed. To avoid flow of water over/around freshly placed concrete, suitable drains and sumps shall be provided.

k. Bonding Mortar: Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the west surface with wire or bristle brushes, care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with neat cement slurry. On this surface, a layer of concrete not exceeding 150mm in thickness shall first be placed and shall well rammed against old work, particular attention being paid to corners and close spots; work thereafter shall proceed in the normal way.

5.47 TRANSPORTATION

a. General: All buckets, containers or conveyors used for transporting concrete shall be mortar-tight. Irrespective of the method of transportation adopted, concrete shall be delivered with the required consistency and plasticity without segregation or loss of slump. However, chutes shall not be used for transport of concrete without the written permission of the Engineer and concrete shall not be re-handled before placing.

b. Re-tempered or Contaminated Concrete: Concrete must be placed in its final position before it becomes too stiff to work. On no account, water shall be added after the initial mixing. Concrete which has become stiff or has been contaminated with foreign materials shall be rejected and disposed off as directed by the Engineer.

c. Cleaning of Equipment: All equipment used for mixing, transporting and placing of concrete shall be maintained in clean conditions. All pans, buckets, hoppers, chutes, pipelines and other equipment shall be thoroughly cleaned after each period of placement.

5.48 PROCEDURE FOR PLACING OF CONCRETE

a. Engineer's approval of Equipment & Methods: Before any concrete is placed, the entire placing programme, consisting of equipment, layout, proposed procedures and methods shall be submitted to the Engineer for approval if so demanded by the Engineer and no concrete shall be placed until Engineer's approval has been received. Equipment for conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete during depositing without segregation of materials, considering the size of the job and placement location.

b. Time Interval between Mixing and Placing: Concrete shall be placed in its final position before the cement reaches its initial set and concrete shall normally be

compacted in its final position within thirty minutes of leaving the mixer and once compacted, it shall not be disturbed.

c. Avoiding Segregation: Concrete shall, in all cases, be deposited as nearly as practicable directly, in its final position, and shall not be re-handled for caused to flow in a manner which will cause segregation, loss of materials, displacement of reinforcement, shuttering or embedded inserts, or impair its strength. For locations where direct placement is not possible, and in narrow forms, the Contractor shall provide suitable drop and "Elephant Trunks" to confine the movement of concrete. Special care shall be taken when concrete is dropped from a height, especially if reinforcement is in the way, particularly in column and thin walls.

d. Placing by Manual Labour: Except when otherwise approved by the Engineer, concrete shall be placed in the shuttering by shawls or other approved implements, and shall not be dropped from a height more than 1.0 m or handled in a manner which will cause segregation.

e. Placing by Mechanical Equipment: The following specification shall apply when placing or concrete by use of mechanical equipment is warranted considering the nature of work involved. The control of placing shall begin at the mixer discharge. Concrete shall be discharged by a vertical drop into the middle of the bucket or hopper and this principle of a vertical discharge of concrete shall be adhered to throughout all stages of delivery until the concrete comes to rest in its final position.

(i) Types of Buckets: Central-bottom-dump buckets of a type that provides for positive regulation of the amount and rate of deposition of concrete in all dumping positions, shall be employed.

(ii) Operation of Bucket: In placing concretes in large open areas, the bucket shall be spotted directly over the position designated and then lowered for dumping. The open bucket shall clear the concrete already in place and the height of drop; shall not exceed 1.0 m. The bucket shall be opened slowly to avoid high vertical bounce. Dumping of buckets on the swing or in any manner which results in separation of ingredients of disturbance of previously placed concrete will not be permitted.

f. Placement in Restricted Forms: Concrete placed in restricted forms by barrows, bugles, cars, short chutes or hand shoveling shall be subject to the requirement for vertical delivery of limited height to avoid segregation and shall be deposited as nearly as practicably in its final position.

g. Chuting: Where it is necessary to use transfer chutes, specific approval of Engineer must be obtained to type, length, slopes, baffles, vertical terminals and timing of operations. These shall be so arranged than an almost continuous flow of concrete is obtained at the discharge and without segregation. To allow for the loss of mortar against the sides of the chutes, the first mixes shall have less coarse aggregate. During cleaning of chutes, the waste water shall be kept clear of the forms. Concrete shall not be permitted to fall from the end of the chutes by more than 1.0 m. Chutes, when approved for use, shall have slopes not flatter than 1 vert : 3 horiz. and not steeper than 1 vert. : 2 horiz. Chutes shall be of metal or metal lines end of rounded cross section. The slopes of all chute sections shall be approximately the same. The slopes of all chute sections shall be approximately the same. The discharge end of the chutes shall be maintained above the surface of the concrete in the forms.

h. Placing by Pumping/Pneumatic Placers:

(i) Concrete may be conveyed and placed by mechanically operated equipment e.g., pumps or pneumatic placers only with the written permission of the Engineer. The slump shall be held to the minimum necessary for conveying concrete by this method.

(ii) When pumping is adopted, before pumping of concrete is started, the pipeline shall be lubricated with one or two batches of mortar composed of one part cement and two parts sand. Cars shall be taken to avoid stoppages in work once pumping has started.

(iii) When a pneumatic placer is used, the manufacturer's advice on layout of the pipeline shall be followed to avoid blockages and excessive wear. Restraint shall be provided at the discharge box to cater for the reaction at this end.

(iv) Manufacturer's recommendations shall be followed regarding concrete quality and all other related matters when pumping/pneumatic placing equipment is used.

j. Concrete in Layers: Concreting, once started, shall be continuous until the pour is completed. Concrete shall be placed in successive horizontal layers of uniform thickness ranging from 15 cm to 90 cm as directed by Engineer. These shall be placed as rapidly practicable to prevent the formation of cold joints or planes of weakness between each succeeding layer within the pour. The thickness of each layer shall be such that it can be deposited before the previous layer has stiffened. The bucket loads or other units of deposit, shall be spotted progressively along the face of the layer with such overlap as will facilitate spreading the layer to uniform depth and texture with a minimum shoveling. Any tendency to segregation shall be corrected by shoveling stones into mortar rather than mortar on to stones. Such a condition shall be corrected by redesign of mix or other means, as directed by the Engineer.

k. Bedding of Layers: The top surface of each pour and bedding planes shall be approximately horizontal unless otherwise instructed.

m. Compaction: Concrete shall be compacted during placing, with approved vibrating equipment until the concrete has been consolidated to the maximum practicable density, is free of pockets of coarse aggregate and fits tightly against all form surfaces, reinforcement and embedded fixtures. Particular care shall be taken to ensure that all concrete placed against the form faces and into corners of forms of against hardened concrete at joints is free from voids or cavities. The use of vibrators shall be consistent with the concrete mix and caution exercised not to over vibrate the concrete to the point that segregation results.

(i) Type of Vibrators: Vibrators shall conform to IS specifications. Type of vibrator to be used shall depend on the structures where concrete is to be placed. Shutter vibrators to be effective, shall be firmly secured to the form work which must be sufficiently rigid to transmit the vibration and strong enough not to be damaged by it. Immersion vibrators in sufficient numbers and each of adequate size shall be used to properly consolidate all concrete. Tapping or external vibrating of forms by hand tools or immersion vibrators will not be permitted.

(ii) Use of Vibrators: The exact manner of application and the most suitable machines for the purpose must be carefully considered and operated by experienced men. Immersion vibrators shall be inserted vertically at points not more than 450 mm apart and withdrawn when air bubbles cease to come to the surface. Immersion vibrators shall be withdrawn very slowly. In no case shall immersion vibrators be used to transport concrete inside the forms. Particular attention be paid to vibration at the top of a lift e.g. in a column or wall.

(iii) Melding Successive Batches: When placing concrete in layers, which are advancing horizontally as the work progresses, great care shall be exercised to ensure adequate vibration, blending and melding of the concrete between the succeeding layers.

(iv) Penetration of Vibrators: The immersion vibrator shall penetrate the layer being placed and also penetrate the layer below while the under layer is still plastic to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.

(v) Vibrating against Reinforcement: Care shall be taken to prevent contact of immersion vibrators against reinforcement steel. Immersion vibrators shall not be allowed to come in contact with reinforcement steel after start of initial set. They shall also not be allowed to come in contact with forms or finished surfaces.

(vi) Use of Form Attached Vibrators: Form attached vibrators shall be used only with specific authorization of the Engineer.

(vii) Use of Surface Vibrators: The use of surface vibrators will not be permitted under normal conditions. However, for thin slabs and similar construction, surface vibrating by specially designed vibrators may be permitted, upon approval of Engineer.

(viii) Stone Pockets and Mortar Pongees: The formation of stone pockets and mortar pondages in corners and against faces of forms shall not be permitted. Should these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for thorough bonding, as directed by the Engineer.

n. Placement Interval: 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 and before the start of a subsequent placement.

p. Special provision in placing: When placing concrete in walls with openings, in floors of integral slabs and beam construction and other similar conditions, the placing shall stop when the concrete reaches the top of the opening in walls or bottom horizontal surface of the slab, as the case may be. Placing shall be resumed before the concrete in place takes initial set, but not until it has had time to settle as determined by the Engineer.

q. Placing concrete through reinforcing steel: When placing concrete through reinforcing steel, care shall be taken to prevent segregation of the coarse aggregate. Where the congestion of steel makes placing difficult, it may be necessary to temporarily move the top steel aside to get proper placement and restore reinforcing steel to design position and the Engineer's approval shall be obtained prior to adopting this method.

r. Bleeding or free water on top of concrete being deposited into the forms, shall be cause to stop the concrete pour and the conditions causing this defect corrected before any further concreting is resumed.

5.49 APPLICATION OF ARALDITE FOR BONDING OF NEW AND OLD CONCRETE

a. General: Araldite epoxy resins may be used to bond fresh concrete to concrete that is fully cured, to give a monolithic bond capable of transmitting high stresses when traditional bonding agents such as cement slurry cannot always be relied upon to provide good adhesion which is particularly the case when large areas are involved. The Araldite based formulation shall be applied to a suitably prepared concrete substrata and the fresh concrete poured as soon as possible, but always during the `open time' of the adhesive. Materials used shall be only as approved by the Engineer. Manufacturer's instructions shall be followed in all respects. General requirements pertaining to the use of Araldite for bonding of new and old concrete are described therein.

b. Formulation:

Araldite	GY250	100 Parts by weight.
Hardener	HY825	20 - do -
Hardener	HY830	20 - do -
Hardener	HY850	20 - do -
Silica Flour		20 - do -

c. Application

(i) Preparation of the Substrata: To obtain good adhesion, it is necessary to have a clean and sound substrata. Preparation can be carried out using a variety of techniques including chemical treatment and mechanical methods such as grinding, milling, abrading, planning and sand blasting. Dust and loose particles resulting from the pre-treatment should be removed by vacuum cleaning or oil-free or blast.

(ii) Mixing: The resin and hardener should be thoroughly mixed before mixing in the dry filler. The mixed, ready to use adhesive should not contain lumps of un-wetted filler and should be of uniform colour. For a total weight of 1 Kg. or less, hand mixing should be sufficient. For quantities in excess of 1 Kg., the use of a mechanical mixer is recommended.

(iii) Pot life and `Open Time':

D. The pot life is the period during which the ready to use ARALDITE based formulation must be applied. After this period, the mix can no longer be worked and will have begun to set in its container. The table below indicates the pot life at different temperatures :

Mix Temperature	Pot life in Minutes
25 os centigrade	90 Minutes.
30 " "	60 "
35 " "	45 "

(The figures in this table are for batches less than 1 Kilogram.)

B. The `Open Time' is the maximum period of time allowable between application of the ARALDITE adhesive and pouring the fresh concrete. Exceeding the `Open Time' would result in considerably reduced adhesion. The adhesive should be applied to the pre-treated substrata as soon as the components have been mixed and fresh concrete poured immediately afterwards.

C. Accurate knowledge of the `Open Time' is essential in case the work is interrupted.

D. Table 9.9 gives the `Open Time' of ARALDITE based formulations as a function of substrata temperature. In all cases, the adhesives shall be applied immediately after mixing. Any delay between mixing and application will reduce the `Open Time'. Fresh concrete must be poured before the adhesive begins to gel. New to old concrete bonding is not recommended at temperatures below 5^{o} C as adequate curing cannot be assured under these circumstances.

(iv) Methods of Application: The shape and size of the concrete structure will determine the method of application used. The ARALDITE based adhesive may be applied by hand using brushes, brooms or any other suitable applicator.

(v) Suitability of the fresh concrete: Best results are obtained when the water / cement ratio of the new concrete is as low as is practicable.

(vi) Coverage: One kilogramme of the mixed ARALDITE adhesive including hardeners and filler covers an area of 2 to 3 Sq.Mts. when applied with a stiff nylon bristle brush. However, the coverage is very much dependent on the finish in the concrete.

d. Handling Precautions: Epoxy resins can cause irritation of the skin in sensitive persons if incorrectly handled. Certain safety precautions must therefore be observed and those handling the resins and hardeners should be given suitable instructions. Those working with epoxy resins should, above all, be instructed that personal cleanliness at the place of work is essential. The resin and hardener should not be allowed to come into direct contact with the skin. The most effective protection is achieved by wearing rubber or polythene gloves, the latter having the advantage that they can be replaced when dirty. They are more pleasant to wear if cotton gloves are worn underneath. Parts of the skin which have come into contact with the resin or hardener should be washed with lukewarm water and a mild soap. Special cleaning creams have also proved to be highly suitable.

5.50 CONSTRUCTION JOINTS

a. A construction joint is defined as a joint in the concrete introduced for convenience in construction at which special measures are taken to achieve subsequent continuity without provision for further relative movement.

b. All the drawings submitted for the Engineer's approval shall indicate position of all construction joints and lifts. No concreting shall be started until the Engineer has approved the method of placing, the positions and form of the construction joints and lifts. The construction joints shall be so located as not to impair the strength of the structure. Rebates, keys or notches shall be formed and water stops inserted as the Engineer may require. The position of construction joints and the size of the formwork panels shall be so coordinated that where possible, the line of any construction joints coincides with the line of a formwork joint and that in any case all construction joint lines and formwork joint lines appear as a regular and uniform series. For all exposed horizontal joints and purposely inclined joints, a uniform joint shall be formed with a batten of approved dimensions to give a straight and neat joint line.

c. Concrete placed to form the face of a construction joint shall have all laitance removed and the aggregate exposed prior to the placing of fresh concrete. The laitance shall wherever practicable be removed by spraying the concrete surface with water under pressure and be removed while the concrete is still green. The whole of the concrete surface forming part of the joint shall be hacked to expose the aggregate. Where aggregate is damaged during hacking, it shall be removed from the concrete face by further hacking. All loose matter shall be removed and the exposed surface thoroughly cleaned by wire brushing, air blasting or washing, leaving the surface thoroughly cleaned by wire brushing, air blasting or washing, leaving the surface clean and damp. Immediately before fresh concrete is placed, a 12 mm. thick layer of sand/cement mortar mixed in the same proportions as in the concrete shall be spread in the horizontal face of the construction joint. A drier mix shall be used for the top lift of horizontal pours to avoid laitance. The new concrete shall be well worked against the prepared face before the mortar sets. Special care shall be taken to obtain thorough compaction and to avoid segregation of the concrete along the joint plane.

5.51 MOVEMENT JOINTS

a. Movement joints are defined as all joints intended to accommodate relative movement between adjoining parts of a structure, special provision being made where necessary for maintaining the water tightness of the joint. The Contractor shall comply with the instructions of manufacturers of proprietary jointing materials and shall, if required by the Engineer, demonstrate that the jointing materials can be applied satisfactorily.

b. The Contractor shall show locations of all movement joints and details thereof on drawings submitted for the Engineer's approval.

c. The surface of set concrete in a movement joint shall, as shown on the Drawings, be painted with two coats of bituminous paint and new concrete shall be placed against it only when the paint is dry. Expansion joints shall be formed by a separating strip of approved preformed joint filler.

d. Caulking grooves shall be provided as shown on the specification drawings. At all joints where a caulking groove is formed, immediately prior to caulking, the groove shall be wire brushed and loose material removed and blown out by compressed air. After the grove has dried, it shall be primed and caulked with approved sealing compound applied in accordance with the manufacturer's instructions. At all caulked joints, the face of the strip and a width of concrete on either side shall be painted with two coats of paint having the same base as the sealing compound.

5.52 WATER STOPS AND JOINT FILLLERS

a. At all construction, contraction and expansion joints in the water retaining structures and wherever specified or directed by the Engineer, water stops shall be provided. The water stops shall be P.V.C., type or of any other equivalent material as approved by the Engineer. P.V.C., water stops shall have a tensile strength of not less than 14 MN/m^2 and elongation at break of not less than 300%. Water stops shall not be exposed to direct sunlight for long periods. Before being concreted in, water stops shall be cleaned of all foreign materials. Wherever provided, water stops shall be placed in such a manner that they are embedded in the adjacent sections of the panels for equal width.

b. As far as possible, jointing on site shall be confined to the making of butt joints in straight runs of water stops. Where it is agreed with the Engineer that it is necessary to make an intersection or change of direction of any joint, other than a butt joint in a straight run on site, a preliminary joint, intersection or change of direction piece shall be made and submitted to such tests as the Engineer may require.

c. Flexible water stops shall be fully supported in the formwork, free of nails and clear of reinforcement and other fixtures. Damaged water stops shall be replaced and during concreting care shall be taken to place the concrete so that water stops do not bend or distort.

d. The different types of water stops to be used in liquid retaining structures will be as follows :-

Type of Joint	**Type of Water Stops**
(i) Partial/Complete contraction joint in walls and slabs.	150 mm wide, ribbed with hollow centre bulb & 5 mm **minimum thickness.**
(ii) Expansion joints in walls and slabs.	225 mm wide, ribbed with hollow centre bulb & 9 mm minimum thickness.
Type of Joint	**Type of Water Stops**
(iii)Construction joint in raft	225mm wide,ribbed without hollow centre bulb & 9 mm minimum thickness.
(iv) Construction joint in wall	150 mm wide, ribbed with hollow centre bulb and **5 mm minimum thickness.**
(v) Expansion joint raft	225 mm wide, ribbed with hollow centre bulb & 9 mm minimum thickness.

e. Jointing Fillers: Joint fillers shall be of durable, compressible, and non-extruding material.

5.53 SEALING COMPOUNDS

Horizontal joints shall, where used in water retaining structures be sealed with a cold pouring polysulphide rubber sealing compound of quality equal to, or better than servicised "Paraseal". Horizontal joints in roofs, floors and other non-water retaining structures shall be sealed with an approved sealant with properties equal to or better than servicised "Paraplastic 41". Vertical joints and joints in the soffits of slabs in both water retaining as well as non-water retaining structures shall be sealed with a trowel or gun applied polysulphide rubber sealing compound such as servised "Vertiseal" or

equivalent. Sealing compounds shall be fully cured before water is permitted to come in contact. At 40^{o} Centigrade, the curing time would be approximately 7 weeks for polysulphide compound.

5.54 TOLERANCES IN CONCRETE SURFACES

a. Concrete surfaces for the various classes of unformed and formed finishes specified in various clauses shall comply with the tolerances shown in Table 9.11 hereunder, except where different tolerances are expressly required by the specification.

b. In the Table 9.11 `line and level' and `dimension' shall mean the lines, levels and cross-sectional dimensions as specified and required.

c. Surface irregularities shall be classified as `abrupt' or `gradual'. Abrupt irregularities include, but shall not be limited to, offsets and fins caused by displaced or misplaced formwork, loose knots and other defects in formwork materials, and shall be tested by direct measurement. Gradual irregularities shall be tested by means of a straight template for plane surfaces or its suitable equivalent for curved surfaces, the template being 3 m long for unformed surfaces and 1.5 m long formed surfaces.

Class of finish	Maximum tolerance (mm) in :			
	Line and Level	Abrupt Irregularity	Gradual Irregularity	Dimension
U 1	12	6	6	-
U 2	6	3	3	-
U 3	6	3	3	-
F 1	12	6	6	+ 12 - 6
F 2	6	6	6	+ 12 - 6
F 3	3	3	3	+ 6 -

Signature of the Tenderer

5.55 UNFORMED SURFACE - CLASS OF FINISH

a. Finishes to unformed surface of concrete shall be classified as U 1, U 2, U 3, `speed' or `bonded concrete'. Where the class of finish is not specified the concrete shall be finished to Class - U 1.

b. Class - U 1 finish is the first stage for Class- U 2 and Class U 3 finishes and for a bonded concrete surface. Class U 1 finish shall be a leveled and screened, uniform plain or ridged, finish which (unless it is being converted to Class U 2, U 3 or bonded concrete) shall not be disturbed in any way after the initial set and during the period of curing, surplus concrete being struck off immediately after compaction.

c. Where a bonded concrete surface is specified, the laitance shall be removed from the Class U 1 finished surface and the aggregate exposed while the concrete is still green.

d. A spaded finish shall be a surface free from voids and brought to a reasonably uniform appearance by the use of shovels as it is placed in the works.

e. Class - U 2 finish shall be a wood float finish. Floating shall be done after the initial set of the concrete has taken place and the surface had hardened sufficiently. The concrete shall be worked no more than is necessary to produce a uniform surface free from screed marks.

f. Class - U 3 finish shall be a hard smooth steel - trawled finish. Trawling shall not commence until the moisture film has disappeared and the concrete has hardened sufficiently to prevent excess laitance from being worked into the surface. The surfaces shall be trawled under firm pressure and left free from trowel marks.

g. The addition of dry cement, mortar or water shall not be permitted during any of the above operation.

5.56 CURING, PROTECTING, REPAIRING AND FINISHING

a. Curing

(i) All concrete shall be cured by keeping it continuously damp for the period of time required for complete hydration and hardening to take place. Preference shall be given to the use of continuous sprays, or ponded water, continuously saturated coverings of sacking, canvas, hessianor other absorbent materials, or approved effective curing compounds applied with spraying equipment capable of producing a smooth, even - textured coat. Extra precautions shall be exercised in curing concrete during cold and hot weather as outlined hereinafter. The quality of curing water shall be the same as that used for mixing concrete.

(ii) Certain types of finish or preparation for over flying concrete must be done at certain stages of the curing process and special treatment may be required for specific concrete surface finish.

(iii) Curing of concretes made of high alumina cement and super-sulphated cement shall be carried out as directed by the Engineer.

(A) Curing with Water: Fresh concrete shall be kept continuously wet for a minimum period of 10 days from the date of placing of concrete, following a lapse of 12 to 14 hours after laying concrete. The curing of horizontal surfaces exposed to the drying winds shall however begin as soon as the concrete has hardened. Water shall be applied to formed surfaces immediately upon removal of forms. Quantity of water applied shall be controlled so as to prevent erosion of freshly placed concrete.

(B) Continuous Spraying: Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliance of hose, sprinklers and spraying devices. Continuous fine mist spraying or sprinkling shall be used, unless otherwise specified or approved by the Engineer.

(C) Alternate curing methods:

(1) Whenever, in the judgment of the Engineer, it is necessary to omit the continuous spray method, a covering of clean sand or other approved means such as wet gunny bags, which will prevent loss of moisture from the concrete, may be used. No type of covering will be approved which would stain or damage the concrete during or after the curing period. Covering shall be kept continuously wet during the curing period.

(2) For curing of concretes in pavements, side-walks, floors, flat roofs of other level surfaces, the ponding method of curing is preferred. The method of containing the ponded water shall be approved by the Engineer. Special attention shall be given to edges and corners of the slabs to ensure proper protection to these areas. The ponded areas shall be kept continuously filled with water during the curing period.

(3) Curing compound: Surface coating type curing compounds shall be used only by special permission of Engineer. Curing compounds shall be liquid type white pigmented, conforming to U.S. Bureau of Reclamation specification. No curing compound shall be used on surfaces where future blending with concrete, water of acid proof membrane, or painting is specified.

(4) Curing equipment: All equipment and materials required for curing shall be on hand and ready for use before concrete is placed.

b. Protecting Fresh Concrete

(i) Fresh concrete shall be protected from defacements and damage due to construction operations by leaving forms in place for an ample period as specified later in this specification. Newly placed concrete shall be protected by approved means such as tarpaulins from rain, sun and winds. Steps as approved by the Engineer shall also be taken to protect immature concrete from damage by debris, excessive lading, vibration, abrasion or contact with other materials, etc., that may impair the strength and/or durability of the concrete. Workmen shall be warned against and prevented from disturbing green concrete during its setting period. If it is necessary that the workmen enter the area of freshly placed concrete, the Engineer may require that bridges be placed over the area.

c. Repair and Replacement of Unsatisfactory Concrete

(i) Immediately after the shuttering is removed, the surface of concrete shall be very carefully gone over and all defective areas called to the attention of the Engineer who may permit patching of the defective areas or also reject the concrete unit either partially or in its entirety. Rejected concrete shall be removed and replaced by the contractor. Holes mortar composed of one part of cement to one and half parts of sand passing 2.36 mm I.S. sieve after removing any loose stones adhering to the concrete. Concrete surfaces shall be finished as described in specifications or as directed by the Engineer.

(ii) Superficial honey combed surfaces and rough patches shall be similarly made good immediately after removal of shuttering, in the presence of the Engineer and superficial water and air holes shall be filled in. The mortar shall be well worked into the surface with a wooden float. Excess water shall be avoided. Unless instructed otherwise by the Engineer, the surface of the exposed concrete placed against shuttering shall be rubbed down immediately on removal of shuttering to remove fine or other irregularities, care being taken to avoid damaging the surface. Surface irregularities shall be removed by grinding.

(iii) If reinforcement is exposed or the honeycombing occurs at vulnerable positions e.g., ends of beams or columns, it may be necessary to cut out the member completely or in part and reconstruct. The decision of the Engineer shall be final in this regard. If only patching is necessary, the edges being cut perpendicular to the affected surface

or with a small under cut if possible. Anchors, tees or dovetail slots shall be provided whenever necessary to attach the new concrete securely in place. An area extending several centimetres beyond the edges and the surfaces of the prepared voids shall be saturated with water for 24 hours immediately before the patching material is placed.

(iv) Use of Epoxy: The use of epoxy for bonding fresh concrete used for repairs will be permitted upon written approval of the Engineer. Epoxies shall be applied in strict accordance with the instructions of the manufacturer.

(v) Method of Repair: Small size holes having surface dimensions about equal to the depth of the hole, holes left after removal of form bolts, grout insert holes and slots cut for repair of cracks shall be repaired as follows. The hole to be patched shall be roughened and thoroughly soaked with clean water until absorption stops. A 5 mm thick layer of grout of equal parts of cement and sand shall be well brushed into the surface to be patched, followed immediately by the patching concrete which shall be well consolidated with a wooden float and left slightly proud of the surrounding surface. The concrete patch shall be built up in 10 mm thick layers. After an hour or more, depending upon weather conditions, it shall be worked off flush with a wooden float and a smooth finish obtained by wiping with hessian. A steel trowel shall be used for this purpose. The mix for patching shall be of the same materials and in the same proportion as that used in the concrete being repaired, although some reduction in the maximum size of the coarse aggregates may be necessary and the mix shall be kept as dry as possible. Mortar filling by air pressure (guniting) shall be used for repair of areas too large and / or too shallow for patching with mortar. Patched surfaces shall be given a final treatment to match the colour and texture of the surrounding concrete. White cement shall be substituted for ordinary cement, if so directed by the Engineer, to match the shade of the patch with the original concrete.

(vi) Curing of Patched Work: The patched area shall be covered immediately with an approved non-staining, water-saturated material such as gunny bags which shall be kept continuously wet and protected against sun and wind for a period of 24 hours. Thereafter, the patched area shall be kept wet continuously by a fine spray, or sprinkling for not less than 10 days. All fillings shall be tightly bonded to the concrete and shall be sound, free from shrinkage cracks after the fillings have been cured and dried.

(vii) Approval by the Engineer: All materials, procedures and operations used in the repair work shall be subject to the approval of the Engineer.

d. <u>Finishing</u>

(i) The type of finish for formed concrete surfaces shall be as follows, unless varied by the Engineer.

(ii) When the structure is in service all the surfaces shall receive no special finish, except repair of damaged or defective concrete, removal of fine and abrupt irregularities, filling defective concrete, removal of fins and abrupt irregularities, filling of holes left by form ties and rods and clean up of loose or adhering debris.

(iii) Surfaces which will be exposed to the weather and which would normally be level, shall be sloped for drainage. Unless a horizontal surface or the slope required is specified, the tops of narrow surfaces such as stair treads, walls, curbs and parapets shall be sloped across the width approximately 1 in 30. Broader surfaces such as walkways, roads, parking areas and platforms shall be sloped about 1 in 50. Surfaces that will be covered by backfill or concrete, sub floors to be covered with concrete topping, terrazzo or quarry tiles, and similar surfaces shall be smooth screeded and levelled to produce even surfaces. Surface irregularities shall not exceed 6 mm. Surfaces which will not be covered by backfill, concrete or tile toppings such as outside decks, floors of galleries and sumps, parapets, gutters, side-walks, floors and slabs, shall be consolidated, screeded and floated. Excess water and laitance shall be removed before final finishing. Floating may be done with hand or power tools and

started as soon as the screeded surface has attained a stiffness to permit finishing operations and these shall be the minimum required to produce a surface uniform in texture and free from screed marks or other imperfections. Joints and edges shall be tooled as specified or as directed by the Engineer.

(iv) Standard finish for exposed concrete: Exposed concrete shall mean any concrete, other than floors or slabs, exposed to view upon completion of the works. Unless otherwise specified, the standard finish for exposed concrete shall be a smooth finish. A smooth finish shall be obtained with the use of lined or plywood forms having smooth and even surface and edges. Panels of forms shall be of uniform size and be as large as practicable and installed with closed joints. Upon removal of forms the joint marks shall be smoothed off and all blemishes, projections etc., removed leaving the surfaces smooth.

(v) Integral cement concrete finish: When specified, an integral cement concrete finish of specified thickness for floors and slabs shall be applied either monolithic or bonded, as specified or directed by the Engineer. The surface shall be tested with a straight edge and any high and low spots eliminated. Floating or trawling of the finish shall be permitted only after all surface water has evaporated. Dry cement or a mixture of dry cement and sand shall not be sprinkled directly on the surface of the cement finish to absorb moisture or to stiffen the mix.

(vi) Rubbed finish: A rubbed finish shall be provided only on exposed concrete surfaces. Upon removal of forms, all fins and other projections on the surfaces shall be carefully removed, offsets leveled and voids and/ or damaged sections immediately saturated with water and repaired by filling with a concrete or mortar of the same composition as was used in the surface. The surfaces shall then be thoroughly wetted and rubbed with carborundum or other abrasive. Cement mortar may be used in the rubbing, but the finished surfaces shall not be brush coated with either cement or grout after rubbing. The finished surfaces shall present a uniform and smooth appearance.

e. Protection: All concrete shall be protected against damage until final acceptance by the Engineer.

5.57 PREPARATION OF EARTH STRATA FOR FOUNDATIONS

a. General: 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, yielding soil shall be removed and replaced with suitable earth well compacted or lean concrete as directed by Engineer. Where specified, lean concrete shall be provided on the earth stratum for receiving concrete, the surface of absorptive soils against which concrete is to be placed shall be moistened thoroughly so that no moisture will be drawn from the freshly placed concrete and later shall help to cure the concrete.

b. The preparation of concrete surfaces upon which additional concrete is to be placed later, shall preferably be done by scarifying and cleaning while the concrete is between its initial and final set. This method shall be used wherever practicable and shall consist of cutting the surface with picks and stiff brooms and by use of an approved combination of air and water jet as directed by the Engineer. Great care shall be taken in performing this work to avoid removal of too much mortar and the weakening of the surface by loosening of aggregate. When it is not practicable to follow the above method, it will be necessary to employ air tools to remove laitance and roughen the surface. The final required result shall be a pitted surface from which all dirt, unsound concrete, laitance and glazed mortar have been removed.

c. Bonding treatment (Mortar)

(i) After rock and concrete surfaces upon which new concrete is to be placed have been scarfied, cleaned and wetted as specified herein, they shall receive a bonding treatment, immediately before placement of the concrete.

(ii) The bonding medium shall be a coat of cement-sand mortar. The mortar shall have the same cement-sand proportions as the concrete which shall be placed on it. The water-cement ratio shall be determined by placing conditions and as approved by the Engineer.

(iii) Bonding mortar shall be placed in sufficient quantity to completely cover the surface, about 10 mm thick for rock surface and about 5 mm thick for concrete surface. It shall be brushed or broomed over the surface and worked thoroughly into all cracks, crevices and depressions. Accumulations or puddles or mortar shall not be allowed to settle in depressions and shall be brushed out to a satisfactory o, as determined by the Engineer.

(iv) Mortar shall be placed at such a rate that it can be brushed over the surface just in advance of the placement of concrete only as much area shall be covered with mortar takes place. The amount of mortar that will be permitted to be placed at any one time, or the area which it is to cover, shall be in accordance with the Engineer's directions.

d. Cleaning and Bonding formed construction joints: Vertical construction joints shall be cleaned as specified above or by other methods approved by the Engineer. In placing concrete against formed construction joints, the surface of the joints, where accessible, shall be coated thoroughly with the specified bed-joints, bonding mortar immediately before they are covered with concrete or by scrubbing with wire brushes dipped into the fresh concrete. Where it is impracticable to apply such a mortar coating, special precautions shall be taken to ensure that the concrete is brought into intimate contact with the surface of the joint by careful pudding and spading with the aid of vibrators and suitable tools.

e. Expansion and contraction joints: Provision shall be made for expansion and contraction in concrete by use of special type joints located wherever necessary and as shown on approved drawings.

5.58 HOT WEATHER REQUIREMENT:

a. All concrete work performed in hot weather shall be in accordance with I.S. 456, except as herein modified. Admixtures may be used only when approved by the Engineer. Adequate provisions shall be made to lower concrete temperatures by cool ingredients, eliminating excessive mixing, preventing exposure of mixers and conveyors to direct sunlight and the use of reflective paint on mixers, etc. The temperature of the freshly placed concrete shall not be permitted to exceed 38 o Centigrade.

b. Consideration shall be given to shading aggregate stock piles from direct rays of the sun and spraying stockpiles with water, use of cold water when available, and burying. insulating, shading and / or painting white the pipelines and water storage tanks and conveyance. In order to reduce loss of mixing water, the aggregate, wooden forms, sub grade, adjacent concrete and other moisture absorbing surfaces shall be well wetted prior to concreting, placement and finishing shall be done as quickly as possible. Extra precautions shall be taken for the protection and curing of concrete. Consideration shall be given to continuous water curing and protection against high temperatures and drying hot winds for a period of at least 7 days immediately after concrete has set and after which normal curing procedures may be resumed.

5.59 PLACING CONCRETE UNDERWATER

a. Under all ordinary conditions, all foundations shall be completely dewatered and concrete placed in the dry. However, when concrete placement under water is necessary, all work shall conform to I.S. 456 and the procedure shall be as follows :-

(i) Method of Placement: Concrete shall be deposited underwater by means of tremies, or drop bottom buckets of approved type.

(ii) Direction, Inspection and Approval: All work requiring placement of concrete underwater shall be designed, directed and inspected with due regard to local circumstances and purposes. All underwater concrete shall be placed according to plans or specifications approved by the Engineer.

5.60 PRECAST CONCRETE

a. General: Pre-cast concrete units, whether manufactured on or off site, shall comply in every way with the provisions of the contract for in situ concrete. Wherever possible, pre-cast units shall be hydraulically pressed. When ready for incorporation in the works, pre-cast units shall be responsible for the accuracy of the level, shape of the bed or platform. A suitable serial number and the date of casting shall be impressed or painted on each unit.

b. Striking Forms: Side shutters shall not be struck in less then 24 hours after depositing concrete and no pre-cast unit shall be lifted until the concrete reaches a strength of at least twice the stress to which the concrete may be subjected to at the time of lifting.

c. Pre-cast Units: The lifting and removal of pre-cast units shall be undertaken without causing shock, vibration or undue bending stresses to or in the units. Before lifting and removal takes place, contractor shall satisfy the Engineer or his representative that the methods he proposes to adopt for these operations will not over - stress or otherwise effect seriously the strength of the pre-cast units. The reinforced side of the units shall be distinctly marked.

d. Curing: All pre-cast work shall be protected from the direct rays of the sun for at least 7 days after casting and during that period each unit shall be kept constantly watered or preferably be completely immersed in water if the size of the unit so permits.

5.61 PRECAST CONCRETE PIPES FOR GROUND WATER DRAINAGE

Concrete porous pipes for ground water drainage shall be made of porous concrete with materials generally in accordance with I.S. 4350. The pipes shall be of uniform cross section and bore and not more than 1 metre in length with square ends. The pipes shall have ogee or rebated joints, the axial length of which shall not be less than (D/36 + 12) mm, where D is the nominal internal diameter of the pipe in millimetres.

5.62 SLOTS, OPENINGS, GROUTING, Etc.

a. Slots, Openings or holes, pockets, etc., shall be provided in the concrete work in the approved positions or as directed by Engineer. Any deviation from the approved drawings shall be made good by contractor at his own expense, without damaging any other work. Sleeves, bolts, inserts etc., shall also be provided in concrete work where so required.

b. Grouting-Standard Grout: Grout shall be provided as specified herein below.

(i) The proportions of grout shall one such as to produce a floatable mixture consistent with minimum water content and shrinkage. The grout proportions shall be limited as follows:

	Use	Grout Thickness	Mix proportions	W/C ratio (Max)
A)	Fluid	Under 25mm	One part portland cement to one part sand.	0.44
B)	General	25mm & over but less than 50mm	One part portland cement to 2 parts of sand	0.53
C)	Stiff Mix.	50mm & over	One part portland cement to 3 parts of sand.	0.53

I.i) Sand shall be such as to produce a floatable grout without any tendency to segregate.

ii) Sand for general grouting purposes, shall be graded within the following limits :

Passing I.S. 2.36 mm sieve	95 to 100%
Passing I.S. 1.18 mm sieve	65 to 95%
Passing I.S. 300 micron sieve	10 to 30%
Passing I.S. 150 micron sieve	3 to 10%

iii) Sand for fluid grouts, shall have the fine material passing the 300 and 150 micron sieves at the upper limits specified above.

iv) Sand, for stiff grouts, shall meet the usual grading specifications for concrete.

II. i) Surfaces to be grouted shall be thoroughly roughened and cleaned of all foreign matter and laitance.

ii) Anchor bolts, anchor bolt holes and the bottoms for equipment and column base plates shall be cleaned of all oil, grease, dirt and loose material. The use of hot, strong caustic solution for this purpose will be permitted.

III. i)prior to grouting, the hardened concrete surfaces to be grouted shall be saturated with water.

ii)Water in anchor bolt holes shall be removed before grouting is started.

(iii) Forms around base plates shall be reasonably tight to prevent leakage of the grout.

(iv) Adequate clearance shall be provided between forms and base plate to permit grout to be worked properly into place.

(v) Grouting, once started, shall be done quickly and continuously to prevent segregation, bleeding and breakdown of initial set. Grout shall be worked from one side of one end to the other to prevent entrapment of air. To distribute the grout and to ensure more complete contact between base plate and foundation and to help release trapped air, link chains can be used to work the grout into place.

(vi) Grout through holes in base plates shall be by pressure grouting.

Variations in grout mixes and procedures shall be permitted if approved by the Engineer.

c. Non-shrinking Grout for Equipment Foundation

(i) Non-shrinking grout shall be used for grouting of machine base plates, anchor bolts, other anchoring devices and at locations where ordinary grouts are ineffective due to shrinkage. It shall be composed of a type of expansive hydraulic sheeting binder and select-graded aggregates. It shall have properties as mentioned below :

A. Maximum grain size	-	6
B. Water % (for 80% flow)	-	15.17
C. Density of hardened grout gm/m1	-	2.27-2.30
D. Compressive strength N/mm²		
-min 3 days	-	23
7 days	-	34
28 days		-45
E. Expansion%		
- free	-	0.15 - 0.2
- restrained	-	0.08 - 0.12

(ii) Mixing, batching, cleaning, preparation of surface and curing of non-shrinking grout shall be done as per Manufacturer's instructions.

5.63 INSPECTION

a. All materials, workmanship and finished construction shall be subject to continuous inspection and approval of the Engineer.

b. All materials supplied by the Contractor and all work or construction performed by the Contractor which is rejected as not being in conformity with the specifications and requirements, shall be immediately replaced.

c. All concrete shall be protected against damage until final acceptance by the Engineer.

5.64 CLEAN-UP

Upon completion of the concrete work, all forms, equipment, construction tools, protective coverings and any debris resulting from the work shall be removed from the premises. All debris, i.e. empty containers, scrap wood, etc., shall be removed to "dump" daily, or as directed by the Engineer. The finished concrete surfaces shall be left in a clean condition satisfactory to the Engineer.

5.65 RECORDS OF CONCRETING

An accurate and up to date record showing times, dates, weather and temperature conditions when various positions of all the concrete structures forming the works were concreted will be kept by the Engineer and shall be countersigned by the Contractor. If the Contractor fails to sign the Engineer's record, it shall nevertheless be regarded as correct and binding on the Contractor.

5.66 SUPPLY OF CEMENT

Contractor shall make their own arrangements for the supply of cement. Further, the Contractor shall be responsible for payments of applicable duties and taxes, port clearance, inland transport etc.

5.67 FOUNDATION BEDDING, BONDING AND JOINTING

a. All surfaces upon or against which concrete will be placed shall be suitably prepared by thoroughly cleaning, washing and dewatering, as specified or as the Engineer may direct, to meet the various situations encountered in the work.
b. Soft or spongy areas shall be cleaned out and backfilled with either a soil-cement mixture, lean concrete or clean sand fill compacted to a minimum density of 90% Modified proctor.
c. Prior to construction of form work for any item where soil will act as bottom form, approval shall be obtained from the Engineer as to the suitability of the soil.

5.68 PREPARATION OF ROCK STRATA OF FOUNDATIONS

a. To provide tight bond with rock foundations, the rock surface shall be prepared and the following general requirements shall be observed.
b. Concrete shall not be deposited on large sloping rock surfaces. Where required by the Engineer, the rock shall be cut to form rough steps or benches to provide roughness or a more suitable bearing surface.
c. Rock foundation stratum shall be prepared by picking, barring, wedging and similar methods which will leave the rock in an entirely sound and unshattered condition.
d. Shortly before concrete is placed, the rock surface shall be cleaned with high pressure water and air jet even though it may have been previously cleaned in that manner.

e. Prior to placing concrete, the rock surface shall be kept wet for a period of 2 to 4 hours unless otherwise directed by the Engineer.

f. Before placing concrete on rock surfaces all water shall be removed from depressions to permit thorough inspection and proper bonding of the concrete to the rock.

SECTION D - FORMWORK

5.69 CENTRING -FORMWORK - FIXING AND GENERAL

a. All centring and formworks shall be constructed of M.S.sheet metal or other approved material. It shall be firmly supported, adequately strutted, braced and tied to withstand the placing and vibrating of concrete and the effects of weather. The tolerance on line and level shall not exceed 3 mm and the soffits of beams other than pre-stressed beams shall in the absence of any specified camber, be erected with an upward camber of 6 mm for each 3 meters of span.

b. The Contractor shall be responsible for the calculations and designs for the formwork, and, if required, shall submit them to the Engineer for approval before construction. On formwork to external faces which will be permanently exposed, all horizontal and vertical formwork joints shall be so arranged that joint lines will form a uniform pattern on the face of the concrete. Where the Contractor proposes to make up the formwork for standard sized manufactured formwork panels, the size of such panels shall be approved by the Engineer before they are used in the construction of the Works. The finished appearance of the entire elevation of the structure and adjoining structures shall be considered when planning the pattern of joint lines caused by formwork and by construction joint to ensure continuity of horizontal and vertical lines.

c. Faces of formwork in contact with concrete shall be free from adhering foreign matter, projecting nails and the like, splits or other defects, and all formwork shall be clean and free from standing water, dirt, shavings, chippings or other foreign matter. Joints shall be sufficiently watertight to prevent the escape of mortar or the formation of fins or other blemishes on the face of the concrete.

d. Formwork shall be provided for the top surfaces of sloping work where the slope exceeds fifteen or from the horizontal (except where such top surface is specified as spaded finish) and shall be anchored to enable the concrete to be properly compacted and to prevent flotation, care being taken to prevent air being trapped.

e. Openings for inspection of the inside of the formwork and for the removal of water used for washing down shall be provided and so formed as to be easily closed before placing concrete. Before placing concrete, all bolts, pipes or conduits or other fixtures which are to be built in shall be fixed in their correct positions, and cores and other devices for forming holes shall be held fast by fixing to the formwork or otherwise. Holes shall not be cut in any concrete without approval of the Engineer.

f. All exterior angles on the finished concrete of 90 o or less shall be given 20 mm x 20 mm chamfers unless otherwise ordered by the Engineer.

g. No ties or bolts or other device shall be built into the concrete for the purpose of supporting formwork without the prior approval of the Engineer. The whole or part of any such supports shall be capable of removal so that no part remaining embedded in the concrete shall be nearer than 50 mm from the surface in the case of reinforced concrete and 150 mm in the case of un-reinforced concrete. Holes left after removal of such supports shall be neatly filled with well rammed dry-pack mortar (Clause 9.86).

h. Formwork in contact with the concrete shall be treated with a suitable non-staining mould oil to prevent adherence of the concrete except where the surface is subsequently to be rendered. Care shall be taken to prevent the oil from coming in contact with reinforcement or with concrete at construction joints. Surface retarding agents shall be used only where ordered by the Engineer.

5.70 REMOVAL OF FORMWORK

a. Formwork shall be so designed as to permit any removal without resorting to hammering or levering against the surface of the concrete.

b. The periods of time elapsing between the placing of the concrete and the striking of the loads likely to be imposed on the concrete and shall in any case be not less than the periods shown in Table 9.13 below. Where soft form work is constructed in a manner during and after such removal of a sufficient number of adequate supporting props in an undisturbed condition, the Contractor may, with the agreement of the Engineer, remove the formwork at the earlier times listed below provided that the props are left in position.

	Type of Formwork	Minimum Period Before Striking Formwork
a)	Vertical formwork to columns, walls, beams	16 – 24 h
b)	Soffit formwork to slabs (Props to be re-fixed immediately after removal of formwork)	3 days
c)	Soffit formwork to beams (Props to be re-fixed immediately after removal of formwork)	7 days
d)	Props to slabs:	
	1) Spanning up to 4.5m	7 days
	2) Spanning over 4.5m	14 days
e)	Props to beams and arches:	
	1) Spanning up to 6m	14 days
	2) Spanning over 6m	21 days

c. Notwithstanding the foregoing, the Contractor shall be held responsible for any damage arising from removal of formwork before the structure is capable of carrying its own weight and any incidental loading.

d. Striking shall be done slowly with utmost care to avoid damage to projections and without shock or vibration, by gently easing the wedges. If after removing the form work it is found that sheet has been embedded in the concrete, it shall be removed and made good as specified earlier.

e. Reinforced temporary openings shall be provided, as directed by the Engineer, to facilitate removal of formwork which otherwise may be inaccessible.

f. The rods, clamps, form bolts, etc. which must be entirely removed from walls or similar structures shall be loosened not sooner than 24 hours nor later than 40 hours after the concrete has been deposited. Ties, except those required to hold forms in place, may be removed at the same time. Ties, withdrawn from walls and grade beams shall be pulled toward the inside face. Cutting ties back from the faces of the walls and grade beams will not be permitted.

g. For liquid retaining structures, no sleeves for through bolts shall be used nor shall through bolts be removed as indicated above. The bolts, in this case, shall be cut at 25 mm depth or more from the surface and then the hole shall be made good by cement sand mortar of the same proportions as the concrete just after striking the formwork.

5.71 FORMED SURFACES - CLASSES OF FINISH

a. Finishes to formed surfaces of concrete shall be classified as F1, F2, or F3, or such other special finish as may be particularly specified. Where the class of finish is not specified the concrete shall be finished to Class F1.

b. Formwork for Class F3 finish shall be lined with as large panels as possible of non-staining material with a smooth unblemished surface such as sanded plywood or hard compressed fibre board, arranged in a uniform approved pattern and fixed to back formwork by oval nails. Un-faced wrought boarding or standard steel panels shall not be permitted.

c. Formwork for Class F2 finish shall be faced with wrought tongued and grooved boards or plywood or metal panels arranged in a uniform approved pattern free from defects likely to detract from the appearance of the surface.

d. Formwork for Class F1 finish shall be constructed in M.S.sheet metal or any suitable materials which will prevent loss of grout when the concrete is vibrated. Surfaces subsequently to be rendered, plastered or tiled shall be adequately scrabbled or hacked as soon as the formwork is removed to reduce the irregularities to not more than half the thickness of such rendering, plastering or bedding for tiles and to provide a satisfactory key.

5.72 DEFECTS IN FORMED SURFACES

a. Workmanship in formwork and concreting shall be such that concrete shall normally require no making good, surfaces being perfectly compacted and smooth.

b. If any blemishes are revealed after removal of formwork, the Engineer's decisions concerning remedial measures shall be obtained immediately. These measures may include, but shall not be limited to, the following:

(i) Fins, pinhole bubbles, surface discoloration and minor defects may be rubbed down with sacking immediately after the formwork is removed.

(ii) Abrupt and gradual irregularities may be rubbed down with carborundum and water after the concrete has been fully cured. These and any other defects shall be remedied by methods approved by the Engineer which may include using a suitable epoxy resin or, where necessary, cutting out to a regular dovetails shape at least 75 mm deep and refilling with concrete over steel mesh reinforcement sprung into the dovetail.

5.73 HOLES TO BE FILLED

a. Holes formed in concrete surfaces by formwork supports or the like shall be filled with dry-pack mortar made from one part by weight of ordinary Portland cement and three parts fine aggregate passing IS sieve 1.18 mm. The mortar shall be mixed with only sufficient water to make the materials stick together when being moulded in the hands.

b. The contractor shall thoroughly clean any hole that is to be filled with dry-pack mortar and where the surface has been damaged, the contractor shall break out any loose, broken or cracked concrete or aggregate. The concrete surrounding the hole shall then be thoroughly soaked after which the surface shall be dried so as to leave a small amount of free water on the surface. The surface shall then be dusted lightly with ordinary Portland cement by means of a small dry brush until the whole surface that will come into contact with the dry-pack mortar has been covered and darkened by absorption of the free water by the cement. Any dry cement in the hole shall be removed.

c. The dry-pack material shall then be placed and packed in layers having a compacted thickness not greater then 15mm. The compaction shall be carried out by use of a hardwood stick and a hammer and shall extend over the full area of the layer, particular care being taken to compact the dry-pack against the sides of the hole. After compaction, the surface of each layer shall be scratched before further loose material is added. The hole shall be finished by laying a hardwood block against the dry-pack fill and striking the block several times. Steel finishing tools shall not be used and water shall not be added to facilitate finishing.

5.74 TOLERANCES

a. Tolerance is a specified permissible variation from lines, grade or dimensions given in approved drawings. No tolerance specified for horizontal or vertical building lines or footings shall be construed to permit encroachment beyond the legal boundaries. Unless otherwise specified, the following tolerances will be permitted:

(i) Tolerances for R.C.C Structures

(A) Variation from the plumb -

(1) In the lines and surfaces of columns, piers, walls and 5 mm per 2.5 m or 25 mm, whichever is less.

(2) For exposed corner columns and other conspicuous lines

In any bay or 5 m maximum	-	5 mm
In 10 m or more	-	10 mm

(B) Variation from the level or from the grades indicated on the approved drawings

(1) In slab soffits, ceilings, beam soffit, and in arrises -

In 2.5 m	-	5 mm
In any bay or 5 m maximum	-	10 mm
In 10 m or more	-	15 mm

(2) For exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines

In any bay or 5 m maximum	-	5 mm
In 10 m or more	-	10 mm

(C) Variation of the linear building lines from established position in plan and related position of columns, wall and partitions

In any bay or 5 m maximum	-	10 mm
In 10 m or more	-	20 mm

(D) Variation in the sizes and locations of sleeves, openings in walls and floors - 5mm except in the case of and for anchor bolts.

(E) Variation in cross -sectional dimensions of columns and beams and in the thickness of slabs and walls.

Minus	-	5 mm
Plus	-	10 mm

(F) Footings

(1) Variation in dimension in plan -

Minus	-	5 mm
Plus	-	50 mm

(2) Misplacement or eccentricity

2% of footing width in the direction of misplacement but not more than 50 mm

(3) Reduction in thickness
Minus - 5% of specified thickness subject to a maximum of 50 mm

(G) Variation in steps -

(1) In a flight of stairs
Rise - 3 mm
Tread - 5 mm
(2) In consecutive steps -
Rise - 1.5 mm
Tread - 3 mm

(ii) Tolerances in other Concrete Structures
(A) All structures
(1) Variation of the constructed linear outline from established position in plan
In 5 m - 10 mm
In 10 m or more - 15 mm
(2) Variations of dimensions to individual structural features from established positions
In 20 m or more - 25 mm
In buried construction - 50 mm
3) Variation from plumb, from specified batter or from curved surfaces of all structures
In 2.5 m - 10 mm
In 5 m - 15 mm
In 10 m or more - 25 mm
In burried construction - Twice the above amounts

4) Variation from level or grade indicated on approved drawings in slab, beams, soffits, horizontal grooves and visible arises
In 2.5 m - 5 mm
In 7.5 m or more - 10 mm
In buried construction - Twice the above amounts

5) Variation in cross-sectional dimensions of columns, beams, buttresses, piers and similar members
Minus - 5 mm
Plus - 10 mm

(iii) Footings for columns, piers, walls, buttresses and similar members.

(A) Variation of dimensions in plan
Minus - 10 mm
Plus - 50 mm

(B) Misplacement or eccentricity
2% of footing width in the direction of misplacement but not more than 50 mm.

(C) Reduction in thickness
5% of specified thickness subject to a maximum of 50 mm.

(iv) Tolerance in other types of structures shall generally conform to those given in Clause 2.4 of Recommended Practice for Concrete Formwork (American Concrete Institute Act 347).

v) Tolerance in fixing anchor bolts shall be as follows :

a) Anchor bolts without sleeves: $\pm$ 5 mm,

b) Anchor bolts with sleeves: $\pm$ 5.0 mm for bolts up to 28 mm dia.

$\pm$ 3.00 mm for bolts above 32 mm dia.

c) Embedded parts $\pm$ 5 mm in all directions.

5.75 BRACINGS, STRUTS AND PROPS

a. Formwork shall be braced, strutted, propped and so supported that it shall not deform under weight and pressure of the concrete and also due to the movement of men and other materials. Bamboos shall not be used as props or cross bearers.

b. The formwork for beams and slabs shall be so erected that the formwork on the sides of the beams and under the soffit of slabs can be removed without disturbing the beam bottoms. Re-propping of beams shall not be done except when props have to be reinstated to take care of construction loads anticipated to be in excess of the design load. Vertical props shall be supported on wedges or other measures shall be taken whereby the props can be gently lowered vertically while striking the formwork.

c. If the formwork for a column is erected for the full height of the column, one side shall be left open and built up in sections as placing of the concrete proceeds, or windows may be left for pouring concrete from the sides to limit the drop of concrete to 1.0 m as directed by the Engineer.

REINFORCEMENT

5.76 Specification

Reinforcement shall be of TMT bars of grade Fe 415 as per I.S.1786-2008. Wire mesh or fabric shall be in accordance with I.S.1566. Substitution of reinforcement will not be permitted.

5.77 STORAGE

The reinforcement shall not be kept in direct contact with the ground but stacked on top of an arrangement of timber sleepers or the like. If the reinforcing rods have to be stored for a long duration, they shall be coated with cement wash before stacking and/or be kept under cover or stored as directed by the Engineer. Fabricated reinforcement shall be carefully stored to prevent damage, distortion, corrosion and deterioration.

5.78 QUALITY

a. Steel should be a product of integrated steel manufacturer and BIS certified Steel manufacture or their authorised dealer. The product name should be embossed in equal intervals. Substitution of reinforcement will not be permitted except upon written approval from the Engineer. All steel be of Grade I quality unless specifically permitted by the Engineer. No re-rolled material will be accepted. The contractor shall necessary submit the manufacturer's test certificate for the steel. Random tests on steel supplied by the contractor may be performed by the Engineer as per relevant Indian standards. All costs incidental to such tests shall be at the contractor's expense. Steel not conforming to specifications shall be rejected.

b. All reinforcements shall be clean, free from grease, oil, paint, dirt, loose mill scale, loose rust, dust, bituminous material or any other substances that will destroy or reduce the bond. All rods shall be thoroughly cleaned before being fabricated. Pitted and defective rods shall not be used. No welding of rods to obtain continuity shall be allowed unless approved by the Engineer. If welding is approved, the work shall be carried out as per I.S.2751 according to the best modern practices and as directed by the Engineer. In all cases of important connections, tests shall be made to prove that the joints are of full strength of bars welded. Special precautions, as specified by the Engineer, shall be taken in the welding of cold worked reinforcing bars and bars other than mild steel.

5.79 LAPS

Laps and splices for reinforcement as per relevant IS specification. Splices in adjacent bars shall be staggered and the locations of all splices, except those specified on the approved Drawings, shall be only as approved by the Engineer. The bars shall not be lapped unless the length required exceeds the maximum available lengths of bars at site.

5.80 BENDING

a. Reinforcement bars supplied bent or in coils, shall be straightened before they are cut to size. Straightening of bars shall be done cold and without damaging the bars.

b. All bars shall be accurately bent according to the sizes and shapes shown on the approved detailed working drawings/bar bending schedules. They shall be bent gradually by machine or other approved means. Reinforcing bars shall not be straightened and re-bent in a manner that will injure the material; bars containing cracks or splits shall be rejected. They shall be bent cold, except bars of over 25 mm in diameter which may be bent hot if specifically approved by the Engineer. Bars which depend for their strength on cold working, shall not be bent hot. Bars bent hot shall not be treated beyond cherry red colour (not exceeding 845 o C) and after bending shall be allowed to cool slowly without quenching. Bars incorrectly bent shall be used only if the means used for straightening and re-bending be such as shall not, in the opinion of the Engineer, injure the material. No reinforcement shall be bent when in position in the work without approval, whether or not it is partially embedded in hardened concrete. Bars having kinks or bends other than those required by design shall not be used.

5.81 FIXING

Reinforcement shall be accurately fixed by any approved means and maintained in the correct position shown in the approved Drawings by the use of blocks, spacers and chairs, as per I.S.2502, to prevent displacement during placing and compaction of concrete. Bars intended to be in contact at crossing points shall be securely bound together at all such points with number 16 size annealed soft iron wire. The vertical distances required between successive layers of bars in beams or similar members shall be maintained by the provision of mild steel spacer bars at such intervals that the main bars do not perceptibly sag between adjacent spacer bars.

5.82 NOMINAL COVER TO REINFORCEMENT

i) Nominal cover is the design depth of concrete cover to all steel reinforcements, including links. It is the dimension used in design and indicated in the drawings. It shall be not less than the diameter of the bar.

ii) Minimum values for the nominal cover of normal weight aggregate concrete which should be provided to all reinforcement, including links depending on the condition of exposure described in Clause-8.2.3 and as given in Table-16 of IS: 456/2000.

iii) However for a longitudinal reinforcing bar in a column nominal cover shall in any case not be less than 40 mm, or less than the diameter of such bar. In the case of columns of minimum dimension of 200 mm or under, whose reinforcing bars do not exceed 12 mm, a nominal cover of 25 mm may be used.

iv) For footings minimum cover shall be 50 mm.

Table-16 of IS: 456/2000 – Nominal cover to Meet Durability Requirements

Exposure	Nominal Concrete cover in mm not Less Than
Mild	20
Moderate	30
Severe	45
Very severe	50
Extreme	75

v) The correct cover shall be maintained by cement mortar cubes or other approved means. Reinforcement for footings, grade beams and slabs on sub-

grade shall be supported on pre-cast concrete blocks as approved by the Engineer. The use of pebbles or stones shall not be permitted.

vi) The 28 days crushing strength of cement mortar cubes/pre-cast concrete cover blocks shall be at least equal to the specified strength of concrete in which these cubes/blocks are embedded.

vii) The minimum clear distance between reinforcing bars shall be in accordance with IS:456.

5.83 INSPECTION

Erected and secured reinforcement shall be inspected and approved by the Engineer prior to placement of concrete.

5.84 WELDING OF REINFORCEMENT

a. Reinforcement which is specified to be welded shall be welded by any process which conforms with the requirements of I.S.2751 and which the Contractor can demonstrate by bend and tensile tests will ensure that the strength of the parent metal is not reduced and that the weld possesses a strength not less than that of the parent metal. The welding procedure established by successful test welds shall be maintained and no departure from this procedure shall be permitted.

b. Welds in positions other than those shown on the approved Drawings shall not be permitted. Tack welding to lightly secure reinforcement in place will be permitted subject to approval of the Engineer.

5.85 SUPPLY OF REINFORCING BARS & MEASUREMENT:

a. Contractor shall make their own arrangements for the supply of steel reinforcement, required for the works. In procurement of reinforcing bars , the contractor shall follow all the regulations of the Engineer/G.O.I in respect of import license etc., if they choose to procure cement from imports. Further, the Contractor shall be responsible for payments of applicable duties and taxes, port clearance, inland transport etc.

b. Reinforcement shall be measured in length including hook, if any , separately for different diameters as actually used in work , excluding overlaps . From the length so measured , the weight of reinforcement shall be calculated in tonnes on the basis of I.S :1732 . Wastage , overlaps , couplings, welded joints, spacer bars , chairs , stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.

Iron Barricading

Iron barricading units shall be arranged in a continuous row using interlocking arrangements. These can be placed along the excavated trench to provide adequate safety measures. The period of time elapsing between the earth work and placing of concrete for cover slab shall be maximum of 28 days. The tenderer should cover the Storm Water drain within 28 days of barricading period. The components of supporting frame on both sides consists of 40mm dia MS pipe (medium) and the middle portion with 25mm size MS square (medium) tubular section. The MS sheet for name board will be of 20 gauge. One unit of Iron barricading will be 2.0 m x1.0m and is a movable type. It shall be so designed as to permit for easy removable & shifting. Necessary traffic sign indication with reflecting stickers shall be provided. Barricading units shall be placed at site with less hindrance to public and as directed by the Engineer in charge. Iron barricading is a temporary barricading and can be removed and reused after the completion of work in a particular stretch.

SECTION 6: DRAWINGS & LOCATIONS

ADYAR WATER SHED

ARTERIAL DRAIN

Sl. No	Zone No	Dn. No.	Location	Size		Length in "M"
				Demolition	Construction	
1	IX	130	P.T Rajan Salai	900X900	1200X1200	350.00
2	IX	130	MGR Canal Arch Drain	900X900	1500X1500	250.00
3	VIII	116	Turn Bulls road	1200x1200	2000X2000	450.00
4	IX	131	Ashok Pillar road	-	1200x1200	750.00
5	IX	135	Alandur road	-	1200x1200	800.00
6	IX	138 &139	Gandhimandapam Road	-	1200X1200	2300.00
7	IX	140	Kathipara road	-	1500x1500	500.00
8	IX	132 &135	West Jones road	1500x1500	2000X2000	750.00
9	X	150	Santhome High road	1200x1200	2000X2000	550.00
10	IX	131	100 feet road	1500x1500	2000X2000	1000.00
11	IX	139	Sardar patel road	1500x1500	2000X2000	250.00
12	IX	139	Anna Salai Crossing	1500x1500	2000X2000	250.00
13	X	151	Mallipoo Nagar	600x750	2000X2000	200.00
					TOTAL	**8400.00**

FEEDER DRAIN

Sl. No	Zone No	Dn. No.	Location	Size		Length in "M"
				Demolition	Construction	
1	VIII	116	Nandanam Extn Ist street	600X750	900X900	340.00
2	VIII	116	Cenetoph Road		900X900	1200.00
3	VIII	115	Eldams Road	900X900	1200X1200	1040.00
4	VIII	115	TTK Road	900X900	1200X1200	890.00
5	VIII	115	Bharathidasan Salai	600X750	1200X1200	950.00
6	X	150	Kasturi Avenue		600x750	170.00

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7	X	150	Sai nagar		600x750	200.00
8	X	150	Karpagam avenue 4th street		600x750	200.00
9	X	150	Vasantha Avenue		600x750	170.00
10	IX	135	Kothavalchavadi street		600x750	350.00
11	X	150	Santhome high road		900x900	600.00
12	X	150	Greenways road		900X900	300.00
13	X	150	Karpagam avenue main road		900X900	370.00
14	X	150	Rohini Garden		900X900	400.00
15	X	150	Santhome high road		900X900	800.00
16	X	150	Janaki avenue		900X900	500.00
17	IX	131	Ashok pillar road		900X900	150.00
18	IX	140	Gandhi nagar main road		900X900	450.00
19	IX	131	Sabdhagiri Colony		900X900	120.00
20	X	150	South Kesavaperumalpuram		1200x1200	450.00
21	X	150	South Canal Bank road		1200x1200	700.00
22	IX	140	100 feet road		1200x1200	450.00
23	IX	140	Anna Salai		1200x1200	800.00
24	IX	139	Taluk Office Road	900X900	1200x1200	800.00
25	IX	140	Anna Salai		1200x1200	450.00
26	IX	140	CIPET Road		1500x1500	450.00
27	IX	141	Velachery main road		1200x1200	750.00
28	IX	118	Chamiers Road		900X900	1100.00
29	IX	122	I Avenue	600X750	900X900	1350.00
30	VIII	122	7th Avenue		900X900	1100.00
31	VIII	122	Kamaraj Salai		900X900	1000.00
32	VIII	122	4th avenue		900X900	330.00
33	VIII	122	Dr.Natesan Salai		900X900	423.00
34	VIII	122	Kannappan salai & 18th avenue	600X750	900X900	900.00
35	VIII	122	2nd Avenue		900X900	600.00
36	VIII	128	Ramasami & Lakshmanasami Salai		900X900	1400.00

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37	VIII	128	Ponnambalam Salai & Munusami Salai	600X750	900X900	1600.00
38	VIII	128	East Vannier Street		900X900	380.00
39	VIII	128	Erikkarai street		900X900	580.00
40	VIII	128	Alagari Swamy Salai	600X750	900X900	720.00
41	VIII	129	Venkateshwara Nagar Main Road		900X900	200.00
42	IX	130	Inside Metor Water pumping Station		1200x1200	200.00
43	IX	130	R.K. Shanmugam Salai	900X900	1200x1200	780.00
44	IX	130	Jeevananatham Salai		900X900	150.00
45	IX	130	P.T.Rajan Salai	900X900	1200x1200	780.00
					TOTAL	**27643.00**

COLLECTOR DRAIN

Sl. No	Zone No	Dn. No.	Location	Size		Length in "M"
				Demolition	Construction	
1	VIII	115	Chittaranjan Road & TTK I cross Street	600X750	900X900	800.00
2	VIII	115	Thiruvalluvar Salai	600X750	900X900	900.00
3	VIII	116	Cenotoph 2nd Lane, Ganapathy colony		600x750	650.00
4	IX	131	Nethaji nagar, Bharadhidasan street		600x750	400.00
5	IX	132	R.R. colony east street, 3rd Street		600x750	250.00
6	IX	132	R.R. colony West Street		600x750	300.00
7	IX	132	RV Nagar 75th and 76th street		600x750	325.00
8	IX	132	Vinayagar koil street, B.K. maistry street and Perumal koil extension		600x750	550.00
9	IX	132	New colony 4th cross street		600x750	200.00
10	IX	135	Perumal Koil street		600x750	175.00
11	IX	135	Divan Basyiuam street		600x750	150.00
12	IX	139	Jayaram street		600x750	150.00
13	IX	139	Muthial street		600x750	200.00
14	IX	140	Achuthan 2nd an 3rd street		600x750	300.00
15	IX	140	Arul Prakasam street		600x750	150.00
16	IX	140	Arumugam street ,Shanmugaraga street		600x750	150.00

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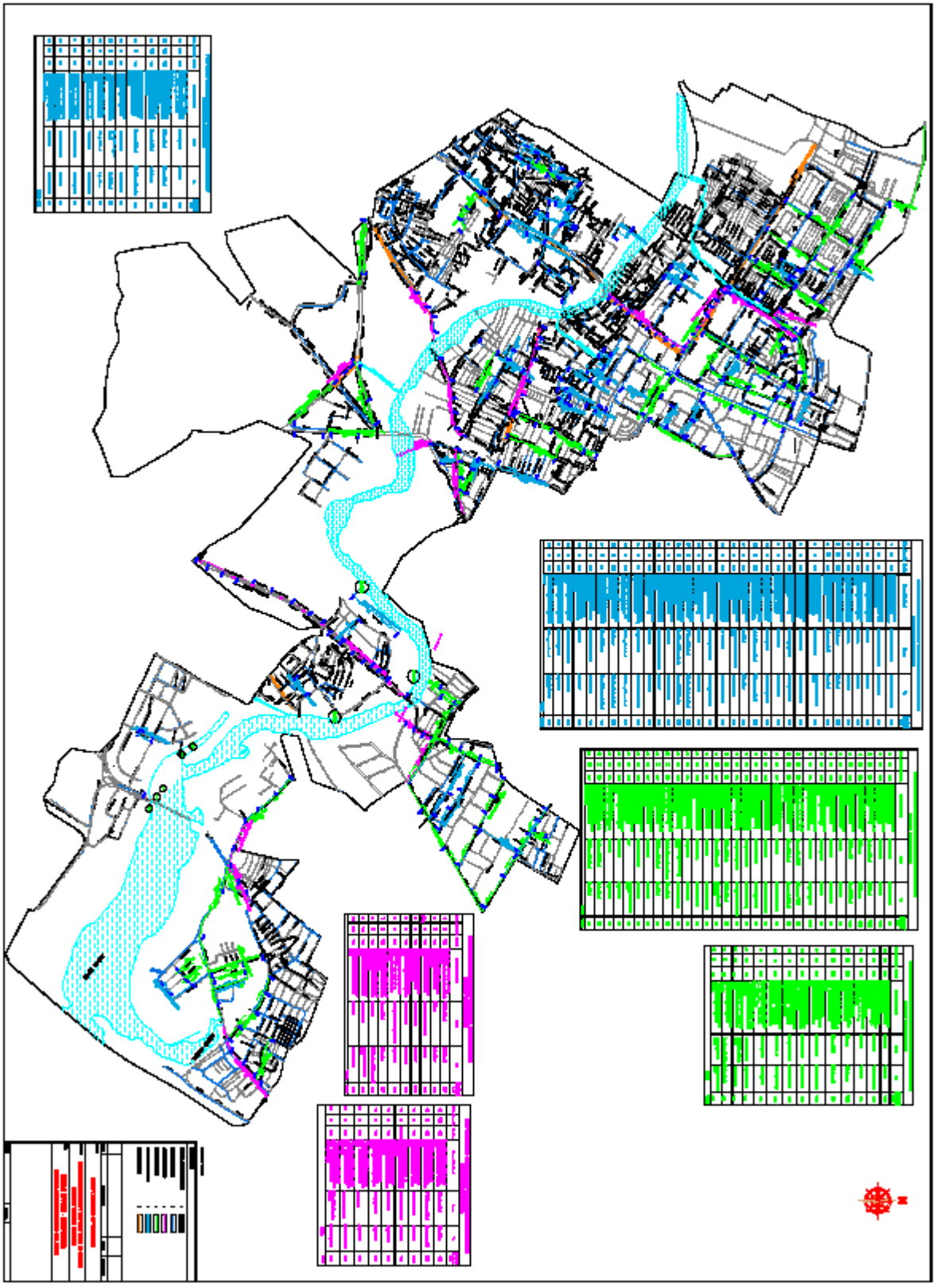
17	IX	140	Mancholai strret		600x750	150.00
18	IX	140	Mancholai II strret		600x750	130.00
19	IX	140	Puillayar koil 2nd street		600x750	100.00
20	IX	140	Ganapathy nagar		600x750	200.00
21	IX	140	Balaji nagar Extn street		600x750	350.00
22	IX	140	Gandhinagar extn,Gandhi nagar street		600x750	250.00
23	IX	138	Murugappa road		900X900	250.00
24	IX	139	Surya Nagar		900X900	250.00
25	IX	140	Car track road	600X750	900X900	250.00
26	IX	131	Pari nagar		900X900	100.00
27	IX	138	Thiruvalluvar Street		600x750	200.00
28	VIII	122	16th Avenue		900X900	300.00
29	VIII	122	47th street		900X900	250.00
30	VIII	122	65th street		900X900	210.00
31	VIII	122	54th street		900X900	230.00
32	VIII	122	8th Avenue		900X900	350.00
33	IIIV	121	KK nagar 15th sector 94,101streets		600x750	420.00
34	IIIV	129	80 feet road		600x750	150.00
35	IX	130	K.K.Nagar 5th sector 22,25,26streets		600x750	500.00
					TOTAL	**10290.00**

Signature of the Tenderer



Signature of the Tenderer

JUNNURM

CORPORATION OF CHENNAI

STORM WATER DRAIN DEPARTMENT

BAR BENDING SCHEDULE OF BOX TYPE DRAIN SIZE 0.60M X0.75M

Signature of the Tenderer

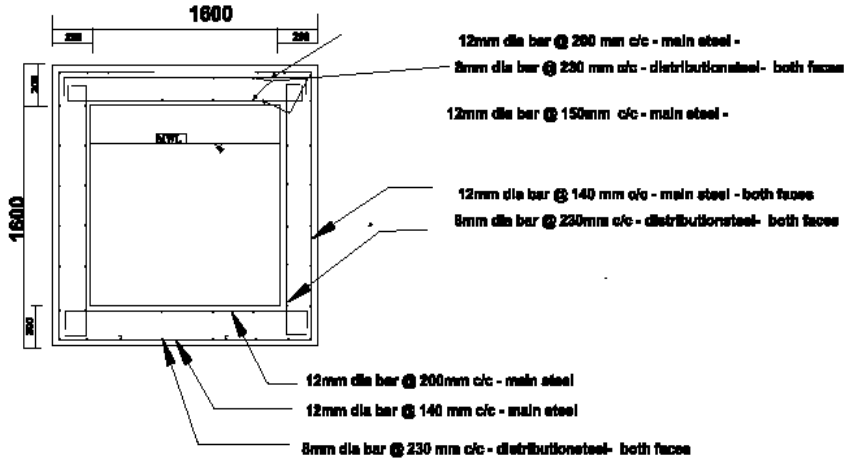
Signature of the Tenderer

JUNNURM

CORPORATION OF CHENNAI

STORM WATER DRAIN DEPARTMENT

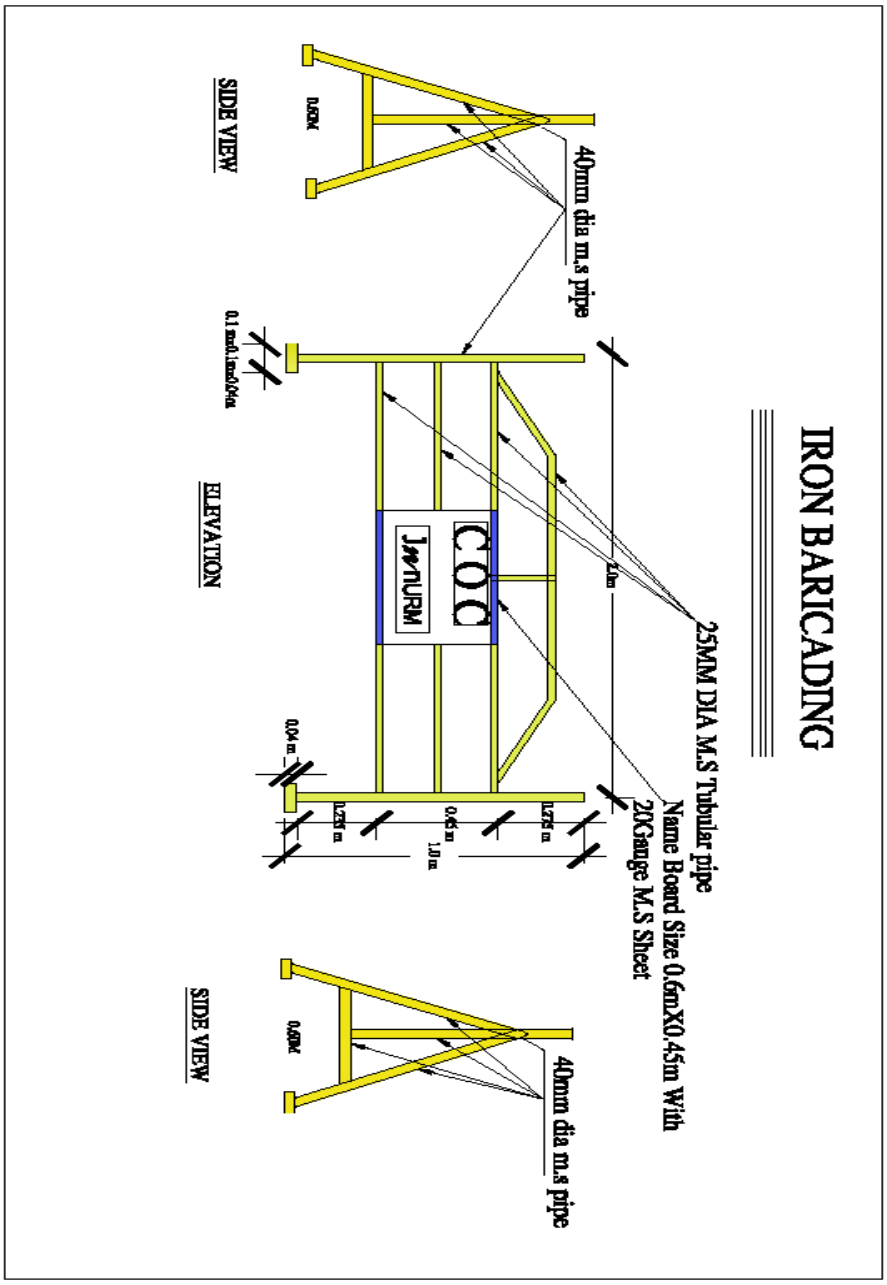
BAR BENDING SCHEDULE OF BOX TYPE DRAIN SIZE 1.20M X1.20M



Signature of the Tenderer

Signature of the Tenderer

Signature of the Tenderer



Signature of the Tenderer

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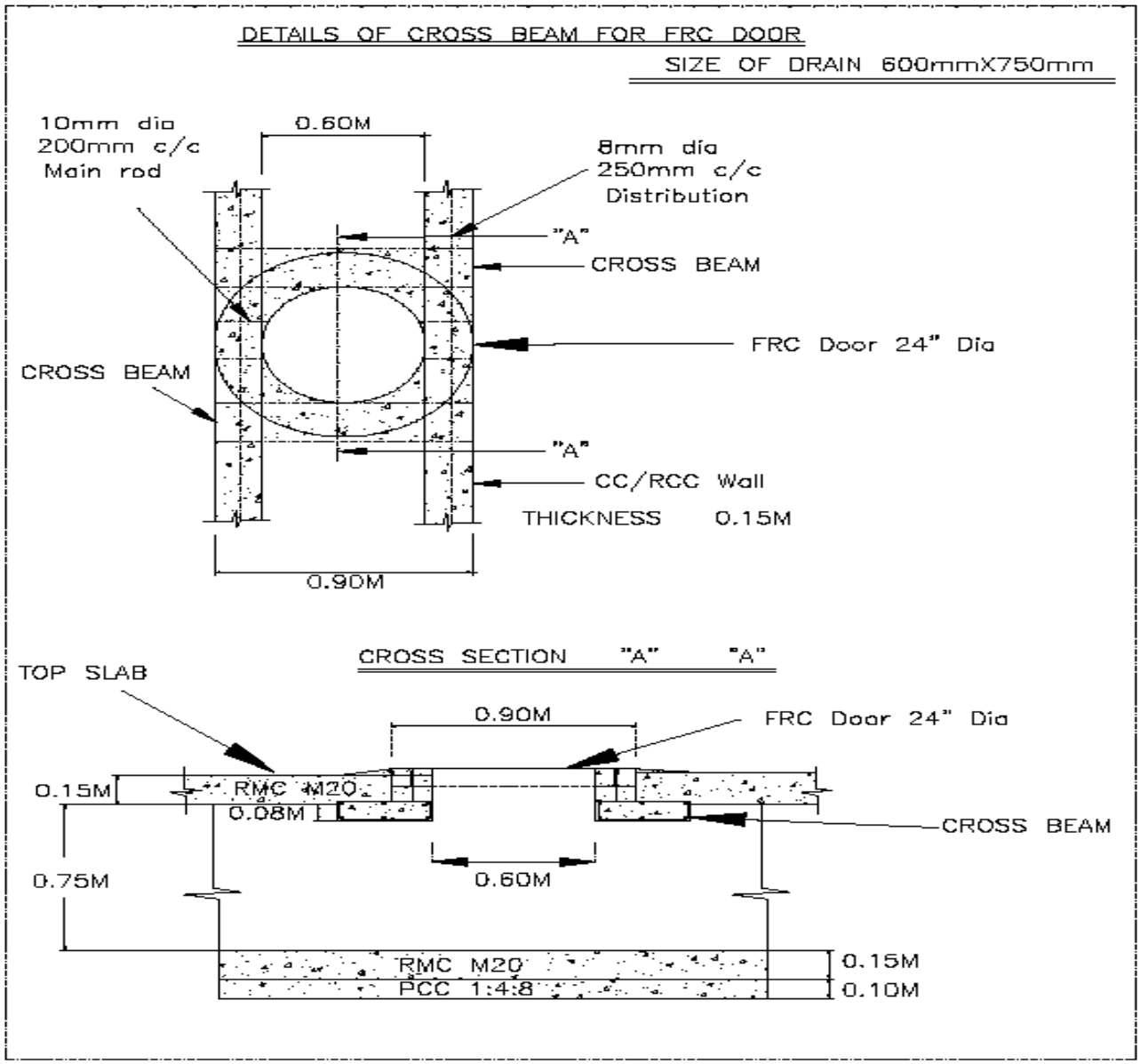

Signature of the Tenderer

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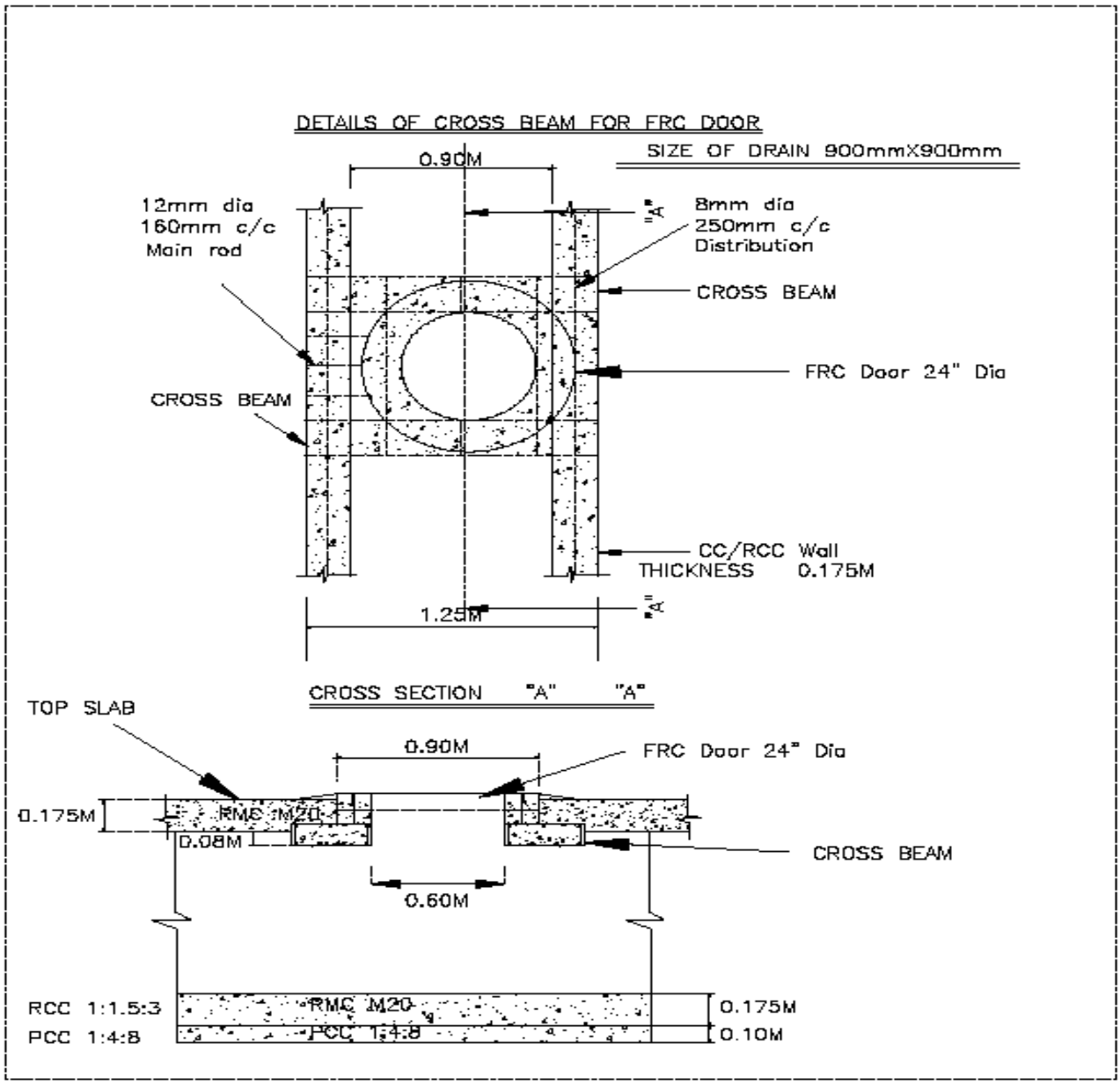
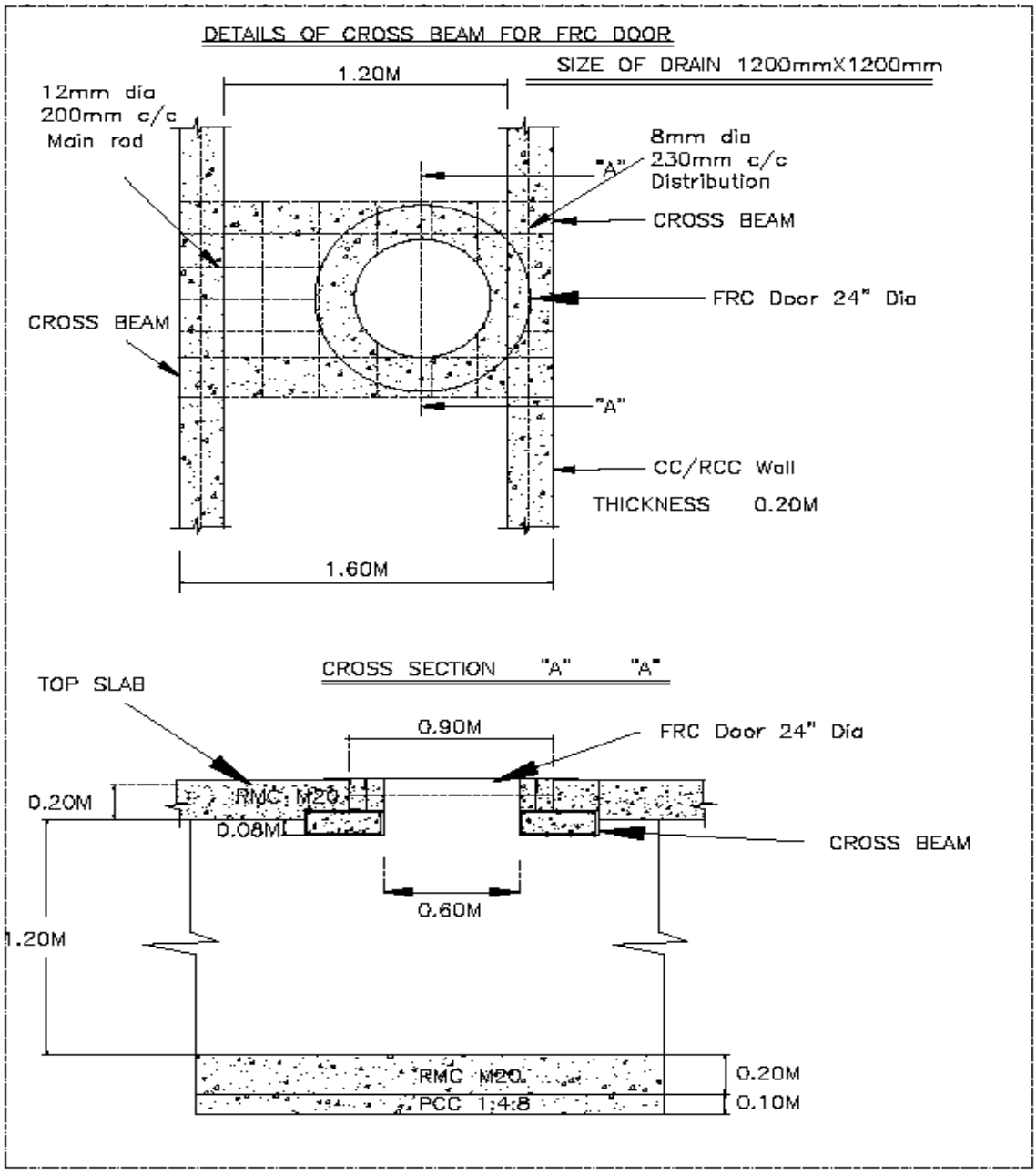


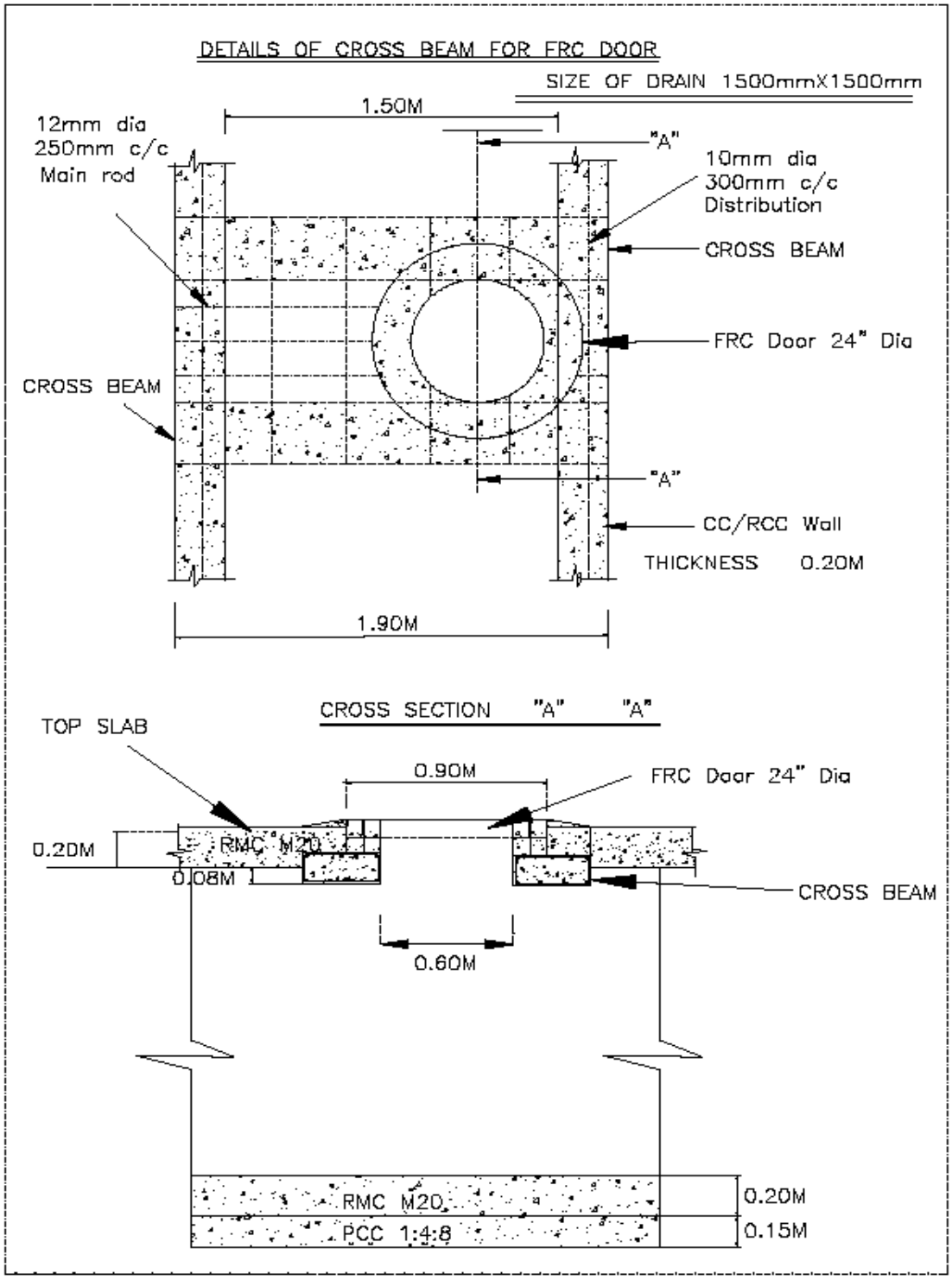
Signature of the Tenderer

MODEL DRAWING



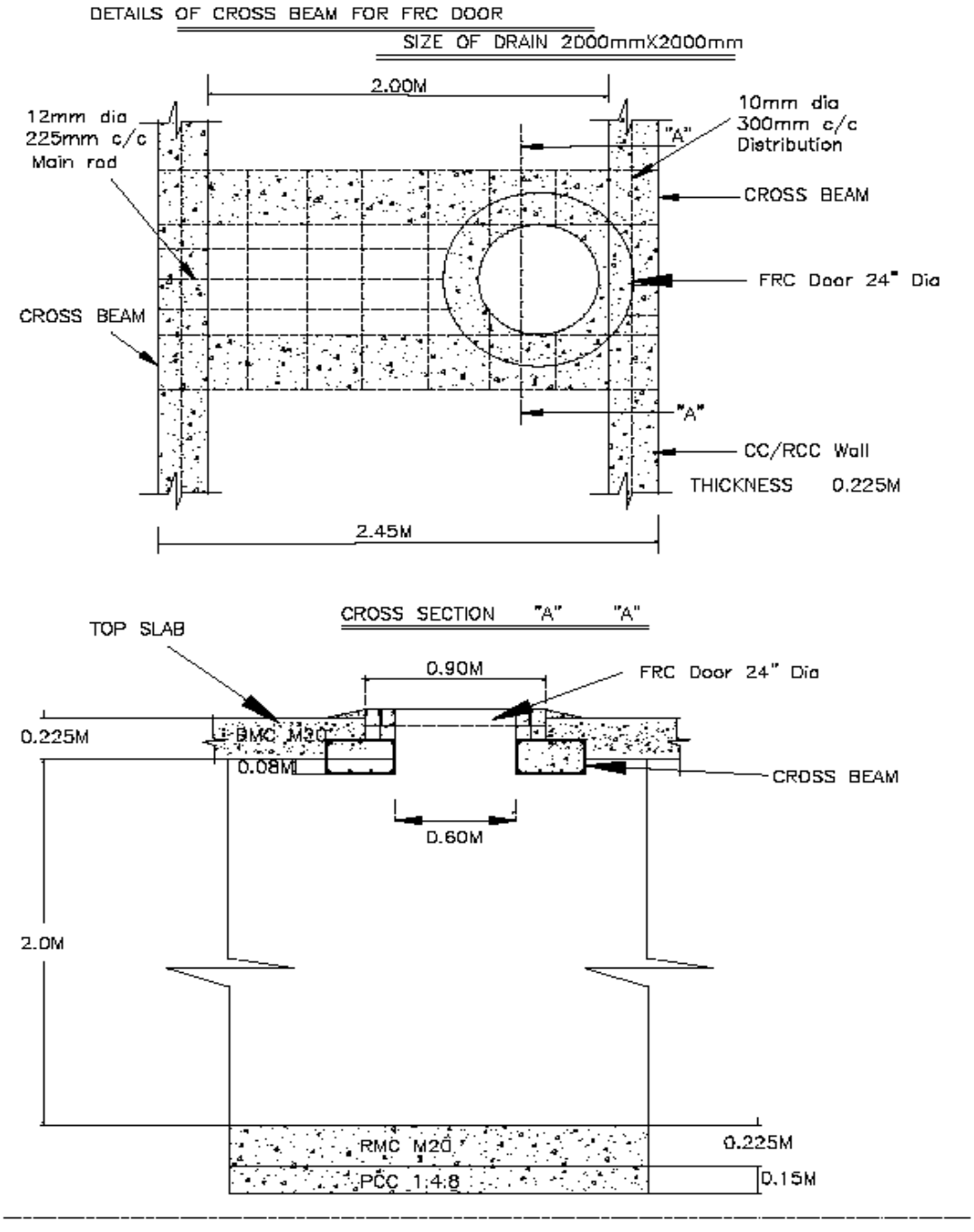
Signature of the Tenderer

MODEL DRAWING



Signature of the Tenderer

MODEL DRAWING



Signature of the Tenderer

NOTIFICATION

IN VIEW OF THE HUGE MEMORY SPACE REQUIRED, THE DETAILED DRAWING MADE AVAILABLE IN THE OFFICE. INTERESTED BIDDER CAN GET THE SOFT COPY OF DETAILED DRAWING FROM OFFICE IN WORKING HOURS AT FREE OF COST.

Signature of the Tenderer

SECTION 8: FORMS OF SECURITIES

Forms of Securities

Acceptable forms of securities are annexed. Bidders should not complete the Performance and Advance Payment Security forms at this time. Only the successful Bidder will be required to provide Performance and Advance Payment Securities in accordance with one of the forms, or in a similar form acceptable to the Employer.

Annex A:	Bid Security (Bank Guarantee)
Annex B:	Performance Bank Guarantee
Annex B1:	Performance Bank Guarantee for Unbalanced Items
Annex C:	Deleted
Annex D:	Bank Guarantee for Advance Payment

BID SECURITY (BANK GUARANTEE)

WHEREAS, _____ *[name of Bidder]* (hereinafter called "the Bidder") has submitted his Bid dated _____ *[date]* for the construction of _____ *[name of Contract]* (hereinafter called "the Bid").

KNOW ALL PEOPLE by these presents that We _____ *[name of bank]* of _____ *[name of country]* having our registered office at _____ (hereinafter called "the Bank") are bound unto _____*[name of Employer]* (hereinafter called "the Employer") in the sum of _____[1] for which payment well and truly to be made to the said Employer the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this _____ day of _____ 19____.

THE CONDITIONS of this obligation are:

(1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified in the Form of Bid;

or

(2) If the Bidder having been notified of the acceptance of his bid by the Employer during the period of Bid validity:

(a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders, if required; or

(b) fails or refuses to furnish the Performance Security, in accordance with the Instruction to Bidders; or

(c) does not accept the correction of the Bid Price pursuant to Clause 27;

we undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of one or any of the three conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date _____[2] days after the deadline for submission of Bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension (s) to the Bank is hereby waived. Any demand in respect of this guarantee should reach the Bank not later than the above date.

DATE _____ SIGNATURE OF THE BANK _____

WITNESS _____ SEAL _____

_____
[signature, name and address]

_____

1 The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees from any Nationalised / Scheduled Bank. This figure should be the same as shown in Clause 16.1 of the Instructions to Bidders.

7 120 days after the end of the validity period of the Bid.

8 Bank Guarantee Validity date should be mentioned specifically.

PERFORMANCE BANK GUARANTEE

To: _____ *[name of Employer]*
_____ *[address of Employer]*

WHEREAS _____ *[name and address of Contractor]* (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. _____ dated _____ to execute _____ *[name of Contract and brief description of Works]* (hereinafter called "the Contract");

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of _____ *[amount of guarantee]* [1] _____ *[in words]*, such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of _____ *[amount of guarantee]*[1] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until …… (i.e.) 28 days from the date of expiry of the Defects Liability Period.

Signature and seal of the guarantor_____
Name of Bank_____
Address_____
Date _____

---

1 An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract and denominated in Indian Rupees from any Nationalised/ Scheduled Bank..

2 Bank Guarantee Validity date should be mentioned specifically.
(whole period of contract + Defects liability period + 28 days)

PERFORMANCE BANK GUARANTEE (for unbalanced items)

To: _____ *[name of Employer]*
_____ *[address of Employer]*

WHEREAS _____ *[name and address of Contractor]* (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. _____ dated _____ to execute _____ *[name of Contract and brief description of Works]* (hereinafter called "the Contract");

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of _____ *[amount of guarantee]* [1] _____ *[in words]*, such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of _____ *[amount of guarantee]*[1] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until …….. (i.e.) 28 days from the date of issue of the certificate of completion of works.

Signature and seal of the guarantor _____
Name of Bank _____
Address _____
Date _____

1. An amount shall be inserted by the Guarantor, representing additional security for unbalanced Bids, if any and denominated in Indian Rupees.

2 This guarantee shall be valid for the full period of contract + 45days.

BANK GUARANTEE FOR ADVANCE PAYMENT

To: _____ *[name of Employer]*
_____ *[address of Employer]*
_____*[name of Contract]*

Gentlemen:

In accordance with the provisions of the Conditions of Contract, sub clause 51.1 ("Advance Payment") of the above-mentioned Contract, _____ *[name and address of Contractor]* (hereinafter called "the Contractor") shall deposit with _____ *[name of Employer]* a bank guarantee to guarantee his proper and faithful performance under the said Clause of the Contract in an amount of _____ *[amount of guarantee]* [1] _____ *[in words]*.

We, the _____ *[bank or financial institution]*, as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, the payment to _____ *[name of Employer]* on his first demand without whatsoever right of objection on our part and without his first claim to the Contractor, in the amount not exceeding _____ [amount of guarantee][1] _____ *[in words]*.

We, further agree that no change or addition to or other modification of the terms of the Contract or of Works to be performed thereunder or of any of the Contract documents which may be made between _____ *[name of Employer]* and the Contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until _____ *[name of Employer]* receives full repayment of the same amount from the Contractor.

Yours truly,

Signature and seal: _____

Name of the Bank / Financial Institution: _____

Address: _____

Date: _____

1 An amount shall be inserted by the bank representing the amount of the Advance Payment and denominated in Indian Rupees.

SECTION 9: PREQUALIFICATION

9.PREQUALIFICATION

9.1 QUALIFICATION CRITERIA:

Prequalification will be based on meeting all the following minimum criteria regarding the applicant's general and particular experience personnel and equipment capabilities, and financial position, as demonstrated by the applicant's responses in the forms attached to the letter of application. Sub – Contractor's experience and resources shall not be taken into account in determining the applicant's compliance with the qualifying criteria. If the bidder does not qualify the minimum qualification criteria (Technical Bid), their financial bid will be returned un open.

9.2 GENERAL EXPERIENCE:

The applicant shall meet the following minimum criteria:

To qualify for award of the contract, each bidder in its name should have in the last five years *i.e for 2005-2006 to 2009-2010.*

(a) Achieved, at least in ONE financial year, a minimum annual financial turnover (in all classes of civil engineering construction works only) of Rs. 52.21 crores.

(b) Satisfactorily completed as a prime contractor, (or as subcontractor or duly certified by the employer) at least one work of a similar nature under a single contract (Bridges/Storm Water Drain /Buildings/Concrete road works) of value not less than Rs.26.10 crores.

(c) In anyone of the two Consecutive years minimum quantities of work as specified below should be completed.

Combination of PCC & RCC in 40740 Cu.m. (in two consecutive Years)

(d) **Weightage**

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 2009-2010 price level.

The following enhancement shall be used for the cost of works executed and the financial figures to a Common base value for work completed.

Year	Factor of indexing
2009-10	1.00
2008-09	1.10
2007-08	1.21
2006-07	1.33
2005-06	1.46

The application will indicate actual figures of cost and amount in the schedule with out accounting for the Above mentioned factors.

Note: Current Year means the years corresponding to the date month and year in which notice inviting tenders for pre-qualification is published.

9.3 EQUIPMENT CAPABILITIES:

The applicant should own or should have assured ownership to the key items of equipment as per list below, in full working order, and must demonstrate that based on known commitment, they will be available for use in the proposed contract.

(v) Minimum requirement of plant, equipments & Machineries

(i) Dumpy level	5 Nos.
Total station	2 Nos
Concrete mixer machine	10 Nos.

Signature of the Tenderer

Needle vibrator with 40 mm needle	15 Nos.
Centring & shuttering material in steel	As required
JCB	4 Nos
Poclain	1 No
Float	1 No
Tipper Lorry	10 Nos
Hydrostatic testing machine	3 Nos
Dewatering Pump (25 HP)	7 Nos
Dewatering Pump (15 HP)	8 Nos
(ii) Concrete batching Plant (Capacity 25m^3 to 40 m^3 per Hour)	1 No
Transit Mixer	12 Nos

(ii) Adequate Steel Strutting Materials and Site laboratory and equipments. Total Stations, levelling instrument, Hydraulic Compression testing machine.
(iii)Tenderer should given an undertaking that the above equipments will be purchased/hired for the project.

9.4 PERSONNEL CAPABILITIES:

The applicant must have suitably qualified personnel to fill the position as specified in below.

1. One Project Manager with B.E.(Civil) with Minimum 15 years experience in Civil Engineering works.
2. One Drainage Engineer with B.E.(Civil) with minimum 10 years experience in Civil Engineering works for each location.
3. One Structural Engineer with B.E.(Civil) with minimum 10 years experience in Civil Engineering works for each location.
4. Two Site Engineer with 10 years experience in Diploma in Civil Engineering work and concrete works for each location.
5. One Testing personnel with B.Sc.,(Chemistry) with Minimum 3 years experience.

The applicant will supply information on a prime candidate and an alternate for each position both of whom should meet the experience requirements.

The above Key personnel are minimum requirement. Further it is required that the bidder should have subordinate technical staff such as CIVIL/Mechanical Supervisor and field engineers, lab assistants/scientists, data entry operator programmers and other clerical support staff.

9.5 FINANCIAL POSITION:G5

LIQUID ASSETS AND/OR AVAILABILITY OF CREDIT FACILITIES

Liquid assets and/or availability of credit facilities to carryout name of work **Construction of storm water drain works in Adyar Water Shed in Chennai city shall not be less than Rs.6.02 crores** in the format given in Section 2..

(Credit lines/letter of credit/certificates from Banks for meeting the funds requirement etc.)

Each bidder shall submit only one bid for one contract. A bidder who submits or participate in more than one bid for same contract will be disqualified.

In respect of bidders bidding more than one contract the available bid capacity will be calculated as per provision in 9.8(b).

9.5.1. The audited balance sheet for the last five years should be submitted which must demonstrate the soundness of the applicant's financial projection for the next two years. Where necessary, the Employer will make inquiries with the applicant's bankers.

9.6.. LITIGATION HISTORY:

The applicant should provide accurate information on any litigation or arbitration resulting from contracts completed or under execution by him over the last five years.

Signature of the Tenderer

9.7 BID CAPACITY:

Bidders who meet the minimum eligible criteria alone will be considered for Financial bids. Available bid capacity shall be more than the total bid value. The available bid capacity will be calculated as under:

Assessed Available Bid capacity = (A*N*1.5 - B)

Where,

A = Maximum value of civil engineering works executed in any one year during the last five years (updated to 2009-2010 price level) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the works for which bids are invited **(26 Months)**

B = Value, at 2009-2010 price level, of existing commitments and on-going works to be completed during the next **26 months**

While evaluating the bid capacity in the opening of Financial bids of subsequent package, the bid value of lowest offer (L1) in other packages (Financial bids opened) value will also be taken in to account and will be treated as work on hand.

Note: The statements showing the value of existing commitments and on- going works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Engineer in charge, not below the rank of an Executive Engineer or equivalent.

(a) Financial bids of various packages will be opened in different dates, starting from higher value of tender package sequentially. The date of opening of Financial Bids will be informed to all the eligible bidders.
(b) While evaluating the bid capacity in the opening of Financial bids of subsequent package, the bid value of lowest offer (L1) in other packages (Financial bids opened) value will also be taken in to account and will be treated as work on hand.

Even though the Applicants meet the above criteria, they are subject to be disqualified if they have

- Made misleading or false representation in the form, statements and attachment submitted, and/or.
- Records of poor performance such as abandoning the work, rescinding of contract for which the reasons are attributable to the non-performance of the contractor, consistent history of litigation awarded against the applicant or financial failure due to bankruptcy.

9.8. CHECK LIST FOR INFORMATION TO BE FURNISHED:

9.8.1. The Documents submitted by the Bidders should be properly indexed. All pages shall be numbered and an Index sheet added in the beginning of Bidding Documents.

9.8.2 Current bid capacity should be worked out by the Bidder in accordance with para – 9.8 above and furnished in Application Form(7). All documents in support of the figures used in working out the Capacity should be attached along with. The five year period to be use for taking out bid capacity and the factors for indexing shall be as below.

Period	Factor for Indexing
2009-10	1.00
2008-09	1.10
2007-08	1.21
2006-07	1.33
2005-06	1.46

A duly filled up check list shall be enclosed as per the Performa given. This shall be added to the index sheet.

S.No.	Name of Document	Whether Submitted Y/N	If yes Refer Page No.
1.	Audited financial statements consisting of profit and loss statements, balance sheets and details about turnover from Civil Engineering works for preceding five years.		
2.	Extent of access to bank loans or credit facilities with ceiling limits, if any prescribed in this regard and certified by the banker themselves.		
3.	Details of current work in progress including value of current outstanding payables etc.,		
4.	Certificates from Competent authority,		
5.	Provisional program for completion of various activities.		
6.	Application form (1) to(11)		
7.	Calculation for current bid capacity.		
8.	Latest Income Tax Clearance Certificate.		
9.	Power of Attorney /Authorization for ♦ Persons Signing the Tender. ♦ For Signing the Tender. ♦ For Partner–in–Charge.		
10.	Summary of quantities of work executed project wise.		

Signature of the Tenderer

LETTER OF APPLICATION

(Letter head paper of the applicant, including full postal address, telephone No. Fax No. Telex No. email address and cable address).
Date:.....
To,
.....
.....
.....
.....
(Name and address for the employer)

Ref: Advertisement inviting bids from Contractors for ....
Sir,

Being duly authorized to represent and act on behalf
of..... (herein after" the applicant"). And having reviewed and fully understood all the qualification information provided, the undersigned here by apply to be prequalified by yourselves as a bidder for the above work.
Attached to this letter are copies of original documents defining.

a) the applicant's legal status.
b) the principal place of business and
c) the place of incorporation (for applicants who are corporations) or the place of registration and the nationality of the owners(for applicant who are partnerships or individually owned firms)
d) Authority letter(s) for signatory(ies).

Your agency and its authorized representatives are hereby authorized to conduct any inquiries or investigations to verify the statements, documents and information submitted in connection with this Application and to seek clarification from our bankers and client regarding any financial and technical aspects. This letter of application will also serve as authorization to any individual or authorized representative of any institution referred to in the supporting information, to provide such information deemed necessary and requested by yourselves to verify statements and information provided in this application or with regard to the resources, experience and competence of the applicant.

Your Agency and its Authorised Representatives may contact the following for further information.

Name of Inquiry	Name, Telephone, Fax and Email Address.
General and Managerial Inquiries.	
Personnel Inquiries.	
Technical Inquiries.	
Financial Inquiries.	

This application is made in the full understanding that Bids by Prequalified Application will be subject to verification of all information submitted for Prequalification.

The undersigned declare that the statements made and the information the duly completed application are complete, true and correct in every detail.

Signature.....
Name.....
For and on behalf of (Name of Applicant).....

APPLICATION FORM(1)

GENERAL INFORMATION

All individuals/firms applying for prequalification are requested to complete the information in this form. Nationality information to be provided for all owners or Applicants who are partnerships or individually owned firms.

Where the Applicant proposes to use named sub-contractors for critical components of the works, or for work contents in excess of 10 percent of the value of the whole works the following information should also be supplied for the specialist sub-contractor(s).

1.	Name of Firm:	
2.	Head Office Address:	
3.	Contact No.	
	Telephone No.	Fax No.
	Email Address	Telex No.
4.	Incorporation/Registration Details.	
	Place of Incorporation / Registration:	Year of Incorporation Registration.

Signature of the Tenderer

APPLICATION FORM(1A)

Structure and Organization:

1. The Applicant is
   a. An Individual Firm.
   b. A Proprietary Firm.
   c. A Firm in Partnership.
   d. A Limited Company or Corporation.

2. Attach the Organization Chart showing the structure of organization include the names of the Director and Position of Officers.

3. Number of Years of Experience:

   a. As a Prime Contractor(Contractor Shouldering Major Responsibility)
      i) in Own Country.
      ii) in other Countries(Specify, Country(ies)).

   b. As Sub-Contractor(Specify Main Contractor)
      iii) in own Country.
      iv) in other Countries (Specify Country(ies)).

4. a) For how many years has your organization been in the business of similar work under its present name? b) What were your fields when your organization was established? c)Whether any new fields were added your organization? d)And if so, When?

   a._____

   b._____

   c._____

   d._____

5. a) Were you ever required to suspend construction for a period of more than six months continuously after you started? b) if so, give name of project and give reasons thereof.
   a._____

   b._____

6. a) Have your ever left the work awarded to you incomplete? b) If so, give name of the project and reasons for not completing work.
   a. _____

   b._____

7. In which fields of civil engineering construction do you claim specialisation and interest?
   _____

8. Give details of your experience in using heavy earthmoving equipment and quality control in compaction of soils.
   _____

9. Give details of your Soil and Material Testing Laboratory if any.

   _____

Signature of the Tenderer

10. Give details of your experience in mechanised granular pavement construction.

_____

11. Give details of your experience in Desilting of Canals.

_____

12. Give details of your experience in Forming of Canals.

_____

13. Give details of your experience in construction of Retaining walls and Storm Water Drain Works.

_____

Signature of the Tenderer

APPLICATION FORM(2)

GENERAL EXPERIENCE RECORD

Name of Applicant:

_____

_____

The Applicants are requested to complete the information in this form. The information supplied should be annual turnover of the Applicant in terms of the amounts billed to Clients for each year for work in progress or completed.

Annual Turnover Data (Construction Works only)		
S.No.	Year	Turnover(Indian Rupees)
1.	2005-2006	
2.	2006-2007	
3.	2007-2008	
4.	2008-2009	
5.	2009-2010	

Signature of the Tenderer

APPLICATION FORM(3)

1. Particular Experience Record : Details of Contractors of Similar Nature.

Name of Applicant :

_____

_____

Use a separate Sheet for each Contract.

S.No.	Description
1.	a) Number of Contract
	b) Name of Contract
	c) Country
2.	Name of Employer
3.	Employers Address
4.	Contract Role
	Sole Contractor
	Sub-Contractor
5.	Value of the total Contract(at completion, or at Date of Award for current contract).
6.	Date of Award (Original and Actual)
7.	Date of Completion(Original and Actual)
8.	Contract duration(Years and Months) Years
	Months
9.	Specify quantities of following Major items of work.
	a) Earth Work
	b) Reinforced Cement concrete
	c) Plain Cement Concrete
10.	Name and professional qualification of applicant's Engineer-in-charge of the work.
11.	Were there any Penalties/Fines/Stop-Notice/Compensation/Liquidated Damages Imposed? (Yes or No) If yes give Amount and Explanation:

Notes:
In case of contracts in foreign currency, the value of the contract converted to Indian Currency (exchange value shall be as at the end of the project) should be stated.

A certificate of completion from the Employer/Engineer must be enclosed.

Signature of the Tenderer

APPLICATION FORM(4)

Personnel Capabilities

Name of Applicant:

_____

_____

For specific position essential to contract implementation, Applicants should provide the names of at least two candidates qualified to meet the specified requirements stated for each position. The data on their experience should be supplied in separate sheet using one Form(5A) for each candidate.

1.	Title of Position	
	Name of Prime Candidate	
	Name of Alternate candidate	
2.	Title of Position	
	Name of Prime Candidate	
	Name of Alternate Candidate	
3.	Title of Position	
	Name of Prime Candidate	
	Name of Alternate Candidate	
4.	Title of Position	
	Name of Prime Candidate	
	Name of Alternate candidate	

Signature of the Tenderer

APPLICATION FORM 5

Candidate Summary

Name of Applicant:
_____

Position Candidate
Prime Alternate

Information about Candidate 1. Name of Candidate 2. Date of Birth:
3. Professional Qualification

Present Employment 4. Name and Address of Employer

Telephone No. Contact(Manager/ Personnel Officer)

Fax No. Tele.No.

Job Title of Candidate: Years with present Employer.

Summarise professional experience over the last 10 years. In reverse chronological Order Indicate particular technical and managerial experience relevant to the project.

From	To	Company/Project/Position/Relevant Technical & Managerial Experience

Signature of the Tenderer

APPLICATION FORM(6)

FINANCIAL STATEMENT

The applicants should provide financial information to demonstrate that they meet the requirements stated in the instructions to applicants. If necessary use separate sheets to provide complete banker information. A copy of the audited balance sheets should be attached.

1. Name of applicant:

_____

_____

2. Summary of assets and liabilities on the basis of the audited financial statement of the last five financial years. (Attach copies of the audited financial statement of the last five financial years.) Based upon known commitments, summarise projected assets and liabilities in Indian Rupees for the next two years.
   Firms owned by individuals and partnerships may submit their balance sheets certified by a registered accountant and supported by copies of tax returns, if audits are not required.

Financial information in Indian Rupees	Actual Previous five Years	Projected: Next two years
Financial Year		
Total Assets		
Current Assets		
Cash temporary investments and current receivable		
Total liabilities		
Current liabilities		
Authorised capital		
Capital issued and paid up		

3. Annual value of construction works, undertaken for each of the last five years and projected for current year:

	Current Year - 1	2 years before	3 years before	4 years before	5 years before
Home					
Abroad					

4. Net Profit before and after Tax:

a)	Current period
	During the last financial year
	During each of the four previous financial years
	Projected for the next 2 years

The profit and loss statements have been certified through_____by_____

5. Specify proposed sources of financing to meet the cash flow demands of the project net of current commitments.

S.No.	Source of financing	Amount in Indian Rupees

Signature of the Tenderer

6. Credit facilities

(a) Name/Address of bank providing credit line.

_____

_____

(b) Total amount of credit line (attach latest certificate from the bank obtained after the tender notice publication)

_____

_____

7. (a) Approximate value of works in hand.
(b) Value of existing commitment of construction works(on going) to be completed during the next_____ months.

8. Value of anticipated orders for next financial year:

Home

_____
_____

Abroad

_____
_____

9. Bid Capacity computation(Give supportive documents):

Signature of the Tenderer

APPLICATION FORM(7)

Litigation History

Name of Applicant:

_____

_____

The applicant should provide information on history of litigation or arbitration resulting from contracts completed or under execution in the last five years.

Year	Award for or AGAINST applicant	Name of Client Cause of Litigation and matter in dispute	Disputed amount (Current value in Indian Rs.)	Actual awarded amount in Indian Rs.

Signature of the Tenderer

APPLICATION FORM(8)

INFORMATION REGARDING CURRENT LITIGATION DEBARRING/EXPELLING OF TENDERER OR ABANDONMENT OF WORK BY TENDERER

1. (a)Has the Applicants history of litigation awarded against him?

   Yes/No

   (b) If yes give details.

2. (a) Has the Applicant been debarred/expelled by any Agency in India, during the last 5 years, excepting on account of reasons, other than non-performance.

Yes/No

   (b) If yes give details.

3. (a) Has the Applicant abandoned any contract work in India, during the last 5 years.

Yes/No

   (b) If yes, details

4. (a) Has the Applicant has been declared bankrupt during the last 5 years?

Yes/No

   (b) If yes, give details, including present status.

Note : If any information in this schedule is found to be incorrect or concealed, application will be summarily rejected.

Signature of the Tenderer

APPLICATION FORM(9)

AFFIDAVIT

I, the undersigned do hereby certify that all the statements made in the required attachments are true and correct.

The undersigned also hereby certifies that our firm M/s._____ have neither abandoned any work nor any contract awarded to us for such works have been rescinded for which the reasons were attributable to the non performance of our firm during last five years to the date of this bid.

The undersigned hereby authorise(s) and request(s) any bank person firm or corporation to furnish pertinent information deemed necessary and request by the Department to verify this statement or regarding my (our) competence and general reputation.

The undersigned understand and agrees that further qualifying information may be requested and agrees to furnish any such information at the request of the Department.

_____
(Signed by an Authorised Officer of the Firm)

_____
Title of Officer

_____
Name of Firm

_____
Date

Signature of the Tenderer

SAMPLE FORMAT FOR EVIDENCE OF ACCESS TO OR AVAILABILITY OF CREDIT FACILITIES –* CLAUSE 4.5 [B] [c] OF ITB

BANK CERTIFICATE

This is to certify that M/s. …… is a reputed company with a good financial standing.

If the contract for the work, namely ……. (Name of work) is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. …… to meet their working capital requirements for executing the above contract.

__ Sd. __

Name of Bank

Senior Bank Manager

Address of the Bank

*** Change the text as follows for Joint venture:**

This is to certify that M/s. …… who has formed a JV with M/s. …… and M/s. ……. for participating in this bid, is a reputed company with a good financial standing.

If the contract for the work, namely ……. [funded by the World Bank] is awarded to the above Joint Venture, we shall be able to provide overdraft/credit facilities to the extent of Rs. ……. to M/s. …….. to meet the working capital requirements for executing the above contract.

[This should be given by the JV members in proportion to their financial participation.]

Signature of the Tenderer

TECHNICAL BID- CHECK LIST

<table>
<tr><td>S.No</td><td>Description</td></tr>
<tr><td>1</td><td>Clause No.4.5A(a)

To qualify for award of the contract, each bidder in its name should have in the last five years i.e. for 2005-2006 to 2009-2010.

(a) Achieved, at least in ONE financial year, a minimum annual financial turnover (in all classes of civil engineering construction works only) of Rs. 52.21 crores.
<table>
<tr><td>Year</td><td>Multiplying Factor</td></tr>
<tr><td>2009-2010</td><td>1.00</td></tr>
<tr><td>2008-2009</td><td>1.10</td></tr>
<tr><td>2007-2008</td><td>1.21</td></tr>
<tr><td>2006-2007</td><td>1.33</td></tr>
<tr><td>2005-2006</td><td>1.46</td></tr>
</table></td></tr>
<tr><td>2</td><td>Clause No. 4.5A(b)

Satisfactorily completed as a prime contractor, (or as subcontractor or duly certified by the employer) at least one work of a similar nature under a single contract (Bridges/Storm Water Drain /Buildings/Concrete road works) of value not less than Rs. 26.10 crores.</td></tr>
<tr><td>3</td><td>Clause No. 4.5A(c)

In anyone of the two Consecutive years minimum quantities of work as specified below should be completed.

Combination of PCC & RCC in 40740 Cu.m. (in two consecutive Years)</td></tr>
<tr><td>4</td><td>Section 2 Clause No.1.6 Technical Personnel Required
<table>
<tr><td>Position</td><td>Name</td><td>Qualifications</td><td>Years of experience in experience (general)</td></tr>
<tr><td>1-Project Manager</td><td></td><td>BE(Civil)</td><td>15</td></tr>
<tr><td>1-Drainage Engineer</td><td></td><td>BE(Civil)</td><td>10</td></tr>
<tr><td>1-Structural Engineer</td><td></td><td>BE(Civil)</td><td>10</td></tr>
<tr><td>2-Site Engineers</td><td></td><td>Diploma(civil)</td><td>10</td></tr>
<tr><td>1- Testing personnel</td><td></td><td>B.Sc.,(Chemistry)</td><td>3</td></tr>
</table></td></tr>
<tr><td>5</td><td>Clause No4.5B
Equipment Capabilities.
(i) Minimum requirement of plant, equipments & Machineries
<table>
<tr><td>(i) Dumpy level</td><td>5 Nos.</td></tr>
<tr><td>Total station</td><td>2 Nos</td></tr>
<tr><td>Concrete mixer machine</td><td>10 Nos.</td></tr>
<tr><td>Needle vibrator with 40 mm needle</td><td>15 Nos.</td></tr>
<tr><td>Centring & shuttering material in steel</td><td>As required</td></tr>
<tr><td>JCB</td><td>4 Nos</td></tr>
</table></td></tr>
</table>

Signature of the Tenderer

	Poclain	1 No
	Float	1 No
	Tipper Lorry	10 Nos
	Hydrostatic testing machine	3 Nos
	Dewatering Pump (25 HP)	7 Nos
	Dewatering Pump (15 HP)	8 Nos
	(ii) Concrete batching Plant	1 No
	(Capacity 25m^3 to 40 m^3 per Hour)	
	Transit Mixer	12 Nos
	(ii) Adequate Steel Strutting Materials and Site laboratory and equipments. Total Stations, levelling instrument, Hydraulic Compression testing machine.	
	(ii)Tenderer should given an undertaking that the above equipments will be purchased/hired for the project.	
6	Clause No. 4.5B(c) Financial Position Liquid Assets/ Credit Facilities	
	Liquid assets and/or availability of credit facilities to carryout name of work **Construction of storm water drain works in Adyar Water Shed in Chennai city shall not be less than Rs.6.02 crores in the format given in Section 2..** **(Credit lines/letter of credit/certificates from Banks for meeting the funds requirement etc.)** Each bidder shall submit only one bid for one contract. A bidder who submits or participate in more than one bid for same contract will be disqualified. In respect of bidders bidding more than one contract the available bid capacity will be calculated as per provision in 9.8(b).	
7	Clause No. 4.3(f) Audited Balance Sheet for the Last Five Years Attested copies to be attached.	
8	Clause No.4.3(i) LITIGATION HISTORY Forms - 7, 8 & 9 should filled up in a Rs.20/- stamp paper signed by notary public and attached.	
9	Clause No.4.7 Bid Capacity - Available bid capacity is more than the total bid value.	
	A= Maximum Value of Construction work executed in any one year during the last 5 years.	
	B= Existing Commitments and on going works to be completed during the next **26months**	
	N= No. of Years for completion of the work. ie., **26months**	
	Bid Capacity = A x N x 1.5 – B	

Signature of the Tenderer

Annexure – 1

Minimum requirement of equipments in a Ground Laboratory

Sl. No.	Name of the equipment	Quantity
I.	**Building Materials including Cement, Mortar & Concrete**	
1	Electronic Balance to weigh up to 5kg with 0.1gm accuracy	1 No.
2	Vicat Apparatus with Consistency, IST and FST Needles	1 Set
3	Cube Mould with Base Plate - Size 70.6mm	9 Nos.
4	Tamping Rod - 15 cm long & 1 cm dia	1 No.
5	Straight Edge (Steel) - 0.5m long	2 Nos.
6	Vibrating Machine with timer (for Cement Mortar cube)	1 No.
7	Curing Tank (Covered)	1 No.
8	Compression Testing Machine - 100 T capacity	1 No.
9	Le Chatelier Apparatus	3 Sets
10	Water Bath	1 No.
11	Blaine Air Permeability Apparatus	1 No.
12	Platform Balance - 100kg Capacity	1 No.
13	Universal Testing Machine - 100 T Capacity	1 No.
14	Electrically operated Drying Oven (upto 225°C)	1 No.
15	Set of Std. Sieves 200mm Dia - sq. hole 4.75mm to 75 micron	1 Set
16	Sieve Shaker 200mm Dia	1 No.
17	Pycnometer (Small)	3 Nos.
18	Set of Std. Sieves 300mm Dia - sq. hole 80mm to 4.75mm	1 Set
19	Pycnometer (Large)	3 Nos.
20	Tamping Rod - 45 cm long & 1.5 cm dia	2 Nos.
21	Laboratory Concrete Mixer	1 No.
22	Slump Cone Apparatus	1 No.
23	Compaction Factor Apparatus	1 No.
24	Cube Mould with Base Plate - Size 150mm	1 Set

Signature of the Tenderer

25	Needle Vibrator	1 No.
26	Compression Testing Machine - 200 T capacity	2 Nos.
27	Concrete Core Drilling Machine	1 No.
28	Thermometer	1 No.
29	Glass bottle (350 ml)	2 Nos.
30	Other Accessories like Sample Trays (up to 600 x 600 x 75 mm), Measuring Jars (upto 1000 cc), etc.	12 Sets
31	PH Meter	1 No.
32	Electrical Conductivity Meter	1 No.
33	Colorimeter	1 No.
34	Glassware Items such as Burette (up to 50 ml), Conical Flask (up to 250 ml), Measuring jar (up to 1000 ml), etc.	6 Sets

II.	**Soils**	
1	Core Cutter Apparatus (for field density)	2 Sets
2	Sand Replacement Apparatus (for field density)	1 Set
3	Top pan Balance 1kg Capacity with 0.01 gm accuracy	1 No.
4	Hydrometer	1 No.
5	Electronic Digital Stop Watch	2 Nos.
6	Liquid Limit Device	1 No.
7	Cone Penetrometer	1 No.
8	Standard Proctor Compaction Apparatus	2 Sets
9	Rapid Moisture Meter	1 No.
10	Hot Plate	1 No.
11	Glass Plate (20cm square & 0.5cm thk)	2 Nos.
12	Other Accessories like Sample Trays (15 cm x 10 cm x 1 cm), etc.	12 Sets
13	Glassware Items such as Pipette (10 ml & 20 ml), Beaker (upto 500 ml), etc.	6 Sets

Note - The above list of equipments is the minimum required for conducting routine and general Quality Control tests. In case any other tests are required to be done, the Department shall direct the Consultant to carry out the same from any recognized laboratory acceptable to the Department.

Signature of the Tenderer

I.	**Building Materials including Cement, Mortar & Concrete**
A	**Cement**
1	Consistency
2	Initial and Final Setting Time
3	Compressive Strength
4	Soundness
5	Fineness
B	**Steel Reinforcement / Bar**
1	Section Weight
2	Tensile Strength
3	Percentage of Elongation
C	**Brick**
1	Water Absorption
2	Efflorescence
3	Compressive Strength
D	**Sand**
1	Sieve Analysis (Grading & Fineness Modulus)
2	Bulk age of moist sand
3	Specific Gravity
4	Water Absorption
5	Impurities in sand (silt, clay, etc.)
6	Organic impurities

E	**Coarse Aggregate**
1	Sieve Analysis (Grading)
2	Water Absorption
3	Specific Gravity
4	Presence of any deleterious material in coarse aggregate
5	Crushing Strength
6	Impact Strength
7	Abrasive Strength

Signature of the Tenderer

F	**Concrete**	
1	Slump Test (Water Cement ratio)	
2	Compressive Strength (7 days & 28 days)	
3	Temperature of concrete	
4	Water Cement ratio	
G	**Water**	
1	pH value	
2	Chloride content	As per
3	Sulphate content	IS:456 - 2000
4	Organic and Inorganic Solids content	
H	**Stone (Revetment, etc.)**	
1	Water Absorption	
J	**Mortar Cube**	
1	Compressive Strength	

II.	**Soils**
1	Moisture Content
2	Field Density test
3	Classification of Soils
4	Atterberg Limits
5	Specific Gravity
6	Standard Proctor

Signature of the Tenderer

SECTION 7: BILL OF QUANTITIES

CORPORATION OF CHENNAI
STORM WATER DRAIN DEPARTMENT

NAME OF THE WORK: Construction of storm water drain works in Adyar Water Shed, Chennai city.

Sl. No	Quantity		Description of work	Rate Rs.P. (Both in Figures and Words)	per	Amount Rs.P.
1	93475.00	Sq.m	Picking existing black top surface - 2 to 10cm thick		Sq.m	
2	4577.00	Cum	Dismantling of RCC Slab including carefully clearing the debris etc., complete.		Cum	
3	10633.00	Cum	Dismantling the existing brick or stone masonry work in cement mortar under 3m high including carefully clearing the debris etc., complete.		Cum	
4	9957.00	Cum	Dismantling Plain Cement Concrete work and clearing the debris etc., complete.		Cum	
5	11698.00	Cum	Desilting of Storm Water Drain		Cum	
6	109279.00	Cum	Earth work excavation for foundation in all kinds of soils in varying depths including dismantling any masonry and roots met within foundation and shoring planks, baling water if necessary including clearing and levelling the site etc., and excluding refilling, complete with an initial lead of 10m and lift of 2m.The earth work for Storm Water drain work to be carefully done with out damaging under ground services.		Cum	
7	8433.00	Cum	Cement concrete work 1:4:8 (1 Cement,4 River sand and 8 blue granite broken stone jelly 40mm gauge) including consolidation curing, etc., complete for foundation etc., up to basement.		Cum	
8	270871.00	Sq.m	Supplying and erecting centring for sides and soffits including supports and shuttering up to 3m high for plane surface such as side slabs of RCC boxing and similar vertical RCC slab, etc., with all cross bracings using mild steel sheets of size 90x60cm and 10gauge stiffened with welded mild steel angles of size 25x25x3mmfor boarding laid over Oak (country wood) joists of size 10x6.5cm spaced at about 90cm centre to centre and supported by casuarina props of 10 to 13cm dia spaced at 75cm centre to centre etc., complete		Sq.m	
9	40724.00	Cum	Providing vibrated reinforce controlled Ready-mix cement concrete M 20 design mix (to be designed with the material to be used) using 20mm ISS size HBG metal including cost and conveyance of all materials to site including cement, handling charges for the same mixing including placing the pump in position, erecting the horizontal and vertical pipe line to the required distance and height, laying, compacting, providing cover blocks finishing smooth the surface including vibration charges curing concrete all other tools, and plants employed and all other incidental charges etc., complete (Excluding cost and fabrication charges of steel and form work) confirming to MORTH Specifications , as directed by		Cum	

Signature of the Tenderer

			the Engineer. (Source MORTH – Standard Data book for Analysis of Rates, I Revision, Page 472 & 473, Case II)			
10	4479062.00	Kg	Supply and fabrication of Fe-415 TMT bars confirming to IS - 1786 – 2008 up to 16 mm dia. Including cost of Steel, transportation at site, fabrication, labour charges for laying the rods, straightening, cutting, bending, tying with soft steel wire 16 or 18 SWG, including overlapping to the required length wherever necessary and placing the reinforcement in position as specified in the drawings including cost of binding wires, provision of spacer bar, placing cover blocks and all other incidental charges etc., complete and as per the direction of Engineer-in-charge.(Please read clause 5.85 of Section 5 of Technical Specification while quoting the rates.)		Kg	
11	1381.00	Cum	Plain cement concrete 1:1.5:3 (1 cement,1.5 river sand and 3 stone jelly 12 to 20mm gauge) including consolidating, curing, etc., complete up to basement.		Cum	
12	390.00	Cum	Cement concrete work 1:1.5:3 (1 cement, 1.5 river sand and 3 blue granite broken stone jelly 12 to 20mm gauge) cast-in-situ including consolidation, curing, etc. ,for all RCC works up to basement.		Cum	
13	41935.00	Cum	Refilling with excavated earth in regular layers of 15cm thick each including carefully ramming, watering consolidating etc., complete for foundation and basement.		Cum	
14	 1342.00 111764.00	 Cum Cum	Carting away the surplus earth and debris to dumping ground in the Corporation land as directed during execution for the following leads. (a) up to 10 Km lead (b) For 12Km lead for every additional lead of 1 km there of. (Payment shall be made as per actual lead & as per actual quantities carted)		 Cum Cum	
15	1012.00	Nos.	Construction of Inspection Chamber of size 2' x 2' x Flush with 24" FRC Manhole door with frame of Manufacturing, supplying and fixing SFRC manhole cover with frame 600mm dia clear opening heavy duty as per IS:12592/2002. The frame & cover shall bear a non fracture load of 20MT for 30seconds with frame height of 165mm, cover height 90mm, Bearing (Seating area of cover)75mm with Hot Dip Galvanizing Hook of cover 16mm, frame edge protection flat of size 25 x 3mm exposed surface of M.S. rings shall be painted with anti corrosive bitumastic paint. The approximate weight of cover & frame 210kg. Fixing of SFRC doors and Frames with flush levels.		E	

16	2805.00	Nos.	Construction of Inspection Chamber of size 3' x 2' x Flush with 24" FRC Manhole door with frame of Manufacturing, supplying and fixing SFRC manhole cover with frame 600mm dia clear opening heavy duty as per IS:12592/2002. The frame & cover shall bear a non fracture load of 20MT for 30seconds with frame height of 165mm, cover height 90mm, Bearing (Seating area of cover)75mm with Hot Dip Galvanizing Hook of cover 16mm, frame edge protection flat of size 25 x 3mm exposed surface of M.S. rings shall be painted with anti corrosive bitumastic paint. The approximate weight of cover & frame 210kg. Fixing of SFRC doors and Frames with flush levels.		E	
17	1768.00	Nos.	Construction of Inspection Chamber of size 4 'x2'x Flush with 24" FRC Manhole door with frame of Manufacturing, supplying and fixing SFRC manhole cover with frame 600mm dia clear opening heavy duty as per IS:12592/2002. The frame & cover shall bear a non fracture load of 20MT for 30seconds with frame height of 165mm, cover height 90mm, Bearing (Seating area of cover)75mm with Hot Dip Galvanizing Hook of cover 16mm, frame edge protection flat of size 25 x 3mm exposed surface of M.S. rings shall be painted with anti corrosive bitumastic paint. The approximate weight of cover & frame 210kg. Fixing of SFRC doors and Frames with flush levels.		E	
18	169.00	Nos.	Construction of Inspection Chamber of size 5'x2'x Flush with 24" FRC Manhole door with frame of Manufacturing, supplying and fixing SFRC manhole cover with frame 600mm dia clear opening heavy duty as per IS:12592/2002. The frame & cover shall bear a non fracture load of 20MT for 30seconds with frame height of 165mm, cover height 90mm, Bearing (Seating area of cover)75mm with Hot Dip Galvanizing Hook of cover 16mm, frame edge protection flat of size 25 x 3mm exposed surface of M.S. rings shall be painted with anti corrosive bitumastic paint. The approximate weight of cover & frame 210kg. Fixing of SFRC doors and Frames with flush levels.		E	
19	471.00	Nos.	Construction of Inspection Chamber of size 2Mx0.6Mx Flush with 24" FRC Manhole door with frame of Manufacturing, supplying and fixing SFRC manhole cover with frame 600mm dia clear opening heavy duty as per IS:12592/2002. The frame & cover shall bear a non fracture load of 20MT for 30seconds with frame height of 165mm, cover height 90mm, Bearing (Seating area of cover)75mm with Hot Dip Galvanizing Hook of cover 16mm, frame edge protection flat of size 25 x 3mm exposed surface of M.S. rings shall be painted with anti corrosive bitumastic paint. The approximate weight of cover & frame 210kg. Fixing of SFRC doors and Frames with flush levels.		E	
20	582.00	Nos.	Construction of Inspection Chamber of size 2' x 2' x Flush with FRC door and with Gully Gratings of Manufacturing, supplying and fixing SFRC gully gratings 600mm dia with clear width- 12 holes of 50mm dia. The frame & cover shall bear a non		E	

			fracture load of 5MT for 30seconds with frame height of 165mm (shall confirm IS: 12592/2002), cover height 90mm, Bearing (Seating area of cover)75mm with Hot Dip Galvanizing Hook of cover 16mm, frame edge protection flat of size 25 x 3mm exposed surface of M.S. rings shall be painted with anti corrosive bitumastic paint. The approximate weight of cover & frame 210kg. Fixing of SFRC doors and Frames with flush levels.			
21	1606.00	Nos.	Construction of Inspection Chamber of size 3' x 2' x Flush with FRC door and with Gully Gratings of Manufacturing, supplying and fixing SFRC gully gratings 600mm dia with clear width- 12 holes of 50mm dia. The frame & cover shall bear a non fracture load of 5MT for 30seconds with frame height of 165mm (shall confirm IS: 12592/2002), cover height 90mm, Bearing (Seating area of cover)75mm with Hot Dip Galvanizing Hook of cover 16mm, frame edge protection flat of size 25 x 3mm exposed surface of M.S. rings shall be painted with anti corrosive bitumastic paint. The approximate weight of cover & frame 210kg. Fixing of SFRC doors and Frames with flush levels.		E	
22	1014.00	Nos.	Construction of Inspection Chamber of size 4' x 2' x Flush with FRC door and with Gully Gratings of Manufacturing, supplying and fixing SFRC gully gratings 600mm dia with clear width- 12 holes of 50mm dia. The frame & cover shall bear a non fracture load of 5MT for 30seconds with frame height of 165mm (shall confirm IS: 12592/2002), cover height 90mm, Bearing (Seating area of cover)75mm with Hot Dip Galvanizing Hook of cover 16mm, frame edge protection flat of size 25 x 3mm exposed surface of M.S. rings shall be painted with anti corrosive bitumastic paint. The approximate weight of cover & frame 210kg. Fixing of SFRC doors and Frames with flush levels.		E	
23	84.00	Nos.	Construction of Inspection Chamber of size 5' x 2' x Flush with FRC door and with Gully Gratings of Manufacturing, supplying and fixing SFRC gully gratings 600mm dia with clear width- 12 holes of 50mm dia. The frame & cover shall bear a non fracture load of 5MT for 30seconds with frame height of 165mm (shall confirm IS: 12592/2002), cover height 90mm, Bearing (Seating area of cover)75mm with Hot Dip Galvanizing Hook of cover 16mm, frame edge protection flat of size 25 x 3mm exposed surface of M.S. rings shall be painted with anti corrosive bitumastic paint. The approximate weight of cover & frame 210kg. Fixing of SFRC doors and Frames with flush levels.		E	
24	261.00	Nos.	Construction of Inspection Chamber of size 2M x 0.6M x Flush with FRC door and with Gully Gratings of Manufacturing, supplying and fixing SFRC gully gratings 600mm dia with clear width- 12 holes of 50mm dia. The frame & cover shall bear a non fracture load of 5MT for 30seconds with frame height of 165mm (shall confirm IS: 12592/2002), cover height 90mm, Bearing (Seating area of cover)75mm with Hot Dip Galvanizing Hook of cover 16mm, frame edge protection flat of size 25 x 3mm exposed surface of M.S. rings shall		E	

			be painted with anti corrosive bitumastic paint. The approximate weight of cover & frame 210kg. Fixing of SFRC doors and Frames with flush levels.			
25	3570.00	M	Supplying and fixing of PVC pipe of 110mm dia (PVC with ISI Monogram with working pressure of 4Kg/Cm2) for chute pipes		M	
26	2367.00	M	Supplying and fixing of PVC pipe of 110mm dia (PVC with ISI Monogram with working pressure of 6Kg/Cm2) for replacing sanitary pipes		M	
27	2382.00	M	Supplying and fixing of PVC pipe of 160mm dia (PVC with ISI Monogram with working pressure of 4Kg/Cm2) for Inlet Connections.		M	
28	2382.00	M	Supplying and jointing 20mm dia PVC pipe, including cutting, threading and jointing with necessary specials fixing to wall with clamps and screws including making holes in the wall or drilling holes in roof and making good the wall or roof after fixing with necessary scaffolding etc., complete.		M	
29	44514.00	KG	Supplying and fixing of M.S. Angle of size ISA 75mm x 75mm x 6mm. Provision for service departments cables laying.		KG	
30	46333.00	M	Providing Iron barricading of size 2.0m width and 1.0m height with 40mm dia M.S. tubular pipe for vertical supports on both sides and three lines horizontal bracings with 25mm dia M.S. tubular square pipe. Name board of size 0.60 x 0.45 m with 20 gauge thick M.S. Sheet including cutting, welding, fabrication with one coat of primer and two coats of Enamel Paint of approved quality for fixing of Indication sticker. The barricading units have interlocking arrangements and should be placed as directed at the site. Iron barricading is a temporary barricading and can be removed and reused after the completion of work in a particular stretch.		M	
TOTAL BID PRICE (in figures and in words)						

Note:

(1) Item for which no rate or price has been entered in will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the **Bill of Quantities** (refer: ITB Clause 13.2 and GCC Clause 43.3).

(2) Unit rates and prices shall be quoted by the bidder in Indian rupee [ITB Clause 14.1].

(3) Where there is a discrepancy between the rate in figures and words, lesser of the two will govern. [ITB Clause 27.1(a)]

4) Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by quantity, the unit rate quoted shall govern [ITB Clause 27.1 (b)].

5) Bill of quantities should be submitted separately as a Financial Bid.

Signature of the Tenderer

MODIFICATION FORMAT
(As per Tender clause 22)

From,

(Letter head paper of the applicant, including full postal address, telephone No. Fax No. Telex No. email address and cable address).

Date:
To,
.....
.....
(Name and address for the employer)

Ref: File No.S.W.D.C.No.B / /2009

Name of work:----------

Modification: I/We have already quoted rates for the above work. Now I/We am/are modifying the Bid as below.

1. Offering a Rebate of --------- percentage (in words) to the amount already quoted for the above referred work.

OR

2. Modified Rates in Serial No. ---------- in Bill of Quantities.

Sl.No	Description of work	Modified Rate per Unit

Signature of the Tenderer

Note: This Modification format shall be signed and has to be submitted in a sealed envelope marked as **'MODIFICATION'** before the last date and time for submission of the tender.

Signature of the Tenderer

Withdrawal Format
(As per Tender clause 22)

From,

(Letter head paper of the applicant, including full postal address, telephone No. Fax No. Telex No. email address and cable address).

Date:

To,
.....
.....
.....
.....
(Name and address for the employer)

Ref: File No.S.W.D.C.No.B / /2009

Name of work:----------

Withdrawal:

I/We herewith withdraw the Bid submitted by me/us for the above work.

Signature of the Tenderer

Note: This Withdrawal format shall be signed and has to be submitted in a sealed envelope marked as **'WITHDRAWAL'** before the last date and time for submission of the tender.

Signature of the Tenderer