Doc No. : SDP/MULA/Dec/20
Date : 15.12.2020
Assign No. : Civil/Tender/2081/2020-21
Date : 15.12.2020.

TENDER DOCUMENT

FOR

DISTILLERY AND INCINERATION BOILER CIVIL WORKS

(ESTIMATED COSTS –
1) ADMIN BLDG., POWER HOUSE, BOILER ETC. - Rs.4, 74,39,307/-
2) DISTILLATION SECTION, FERMENTATION SECTION ETC. – Rs. 4,96,18,290/-
3) EVAPORATION SECTION, STORAGE SECTION ETC. – Rs. 3,16,43,427/-
4) RCC CHIMNEY AND FOUNDATION 3m Dia.72m Ht. – Rs. 1,10,75,597/-)

AT

MULA SAHAKARI SAKHAR KARKHANA LIMITED
P.O :- Sonai, Tal :- Newasa, Dist :- Ahmednagar 414 105.

Prepared by

SHIVAJI D.PATIL
FIE, B.S (CIVIL)
M.S.STRUCTURAL (USA)

NINAD S.PATIL
ARCHITECT

YUGANDHAR N.PATIL
AMIE, B.S. (CIVIL)
M.E.STRUCTURAL (USA)

•SDP• Group

•CONSULTING •ARCHITECTURAL •CIVIL •STRUCTURAL •CONSTRUCTION PLANNING • PROGRAMMING

REGISTERED OFFICE: 2nd FLOOR,S 12,15,16,UTILITY CENTRE,OPP. RAJIV GANDHI BHAVAN,SHARANPUR ROAD, NASHIK 422002 MAHARASHTRA (INDIA)
☎: 91-253-2581016
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Dec 2020

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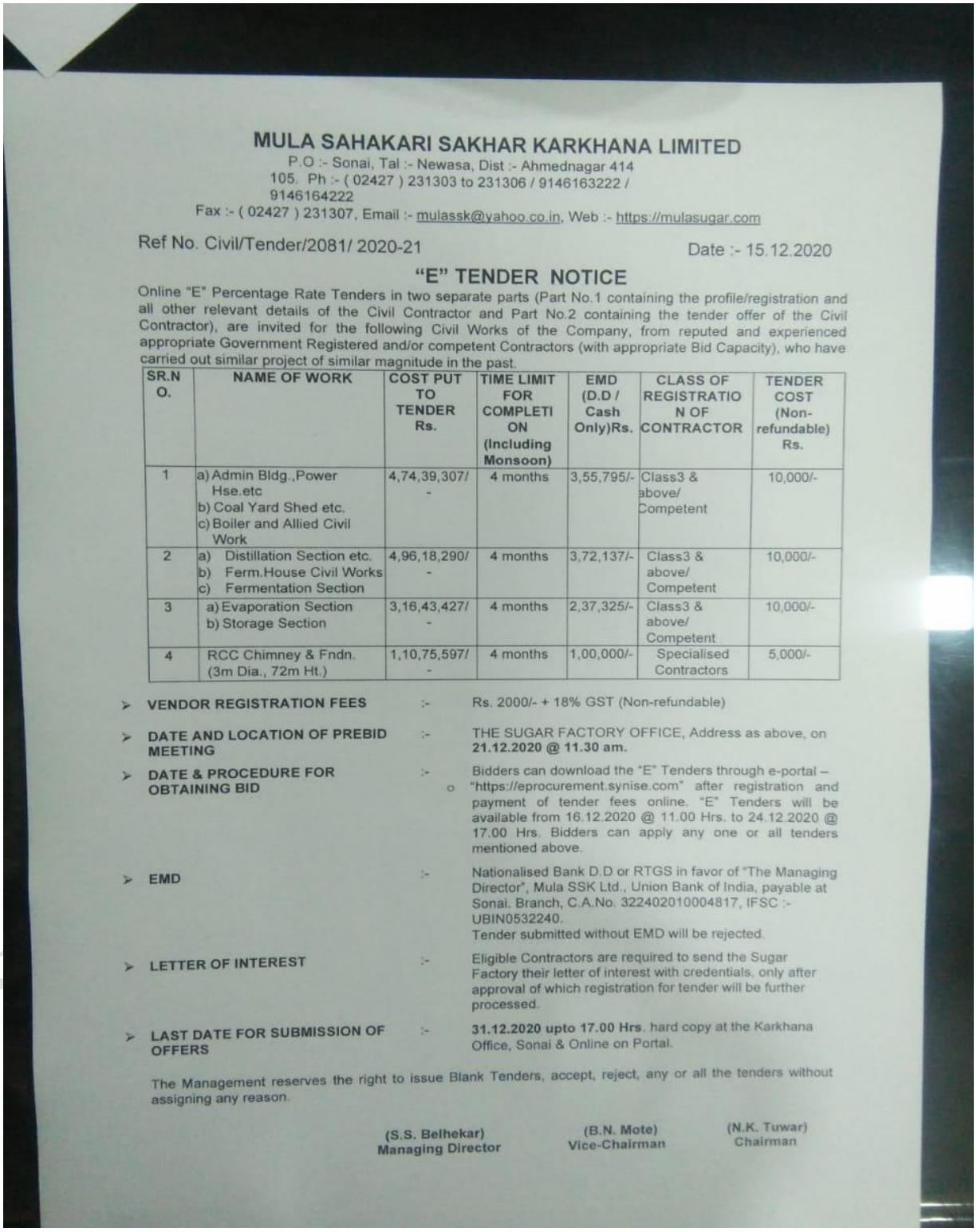

MULA SAHAKARI SAKHAR KARKHANA LIMITED

P.O :- Sonai, Tal :- Newasa, Dist :- Ahmednagar 414 105. Ph :- (02427) 231303 to 231306 / 9146163222 / 9146164222
Fax :- (02427) 231307, Email :- mulassk@yahoo.co.in, Web :- https://mulasugar.com

Ref No. Civil/Tender/2081/ 2020-21 Date :- 15.12.2020

"E" TENDER NOTICE

Online "E" Percentage Rate Tenders in two separate parts (Part No.1 containing the profile/registration and all other relevant details of the Civil Contractor and Part No.2 containing the tender offer of the Civil Contractor), are invited for the following Civil Works of the Company, from reputed and experienced appropriate Government Registered and/or competent Contractors (with appropriate Bid Capacity), who have carried out similar project of similar magnitude in the past.

SR.NO.	NAME OF WORK	COST PUT TO TENDER Rs.	TIME LIMIT FOR COMPLETION (Including Monsoon)	EMD (D.D / Cash Only)Rs.	CLASS OF REGISTRATION OF CONTRACTOR	TENDER COST (Non-refundable) Rs.
1	a) Admin Bldg.,Power Hse.etc b) Coal Yard Shed etc. c) Boiler and Allied Civil Work	4,74,39,307/-	4 months	3,55,795/-	Class3 & above/ Competent	10,000/-
2	a) Distillation Section etc. b) Ferm.House Civil Works c) Fermentation Section	4,96,18,290/-	4 months	3,72,137/-	Class3 & above/ Competent	10,000/-
3	a) Evaporation Section b) Storage Section	3,16,43,427/-	4 months	2,37,325/-	Class3 & above/ Competent	10,000/-
4	RCC Chimney & Fndn. (3m Dia., 72m Ht.)	1,10,75,597/-	4 months	1,00,000/-	Specialised Contractors	5,000/-

- **VENDOR REGISTRATION FEES** :- Rs. 2000/- + 18% GST (Non-refundable)
- **DATE AND LOCATION OF PREBID MEETING** :- THE SUGAR FACTORY OFFICE, Address as above, on **21.12.2020 @ 11.30 am.**
- **DATE & PROCEDURE FOR OBTAINING BID** :-
  - Bidders can download the "E" Tenders through e-portal – "https://eprocurement.synise.com" after registration and payment of tender fees online. "E" Tenders will be available from 16.12.2020 @ 11.00 Hrs. to 24.12.2020 @ 17.00 Hrs. Bidders can apply any one or all tenders mentioned above.
- **EMD** :- Nationalised Bank D.D or RTGS in favor of "The Managing Director", Mula SSK Ltd., Union Bank of India, payable at Sonai. Branch, C.A.No. 322402010004817, IFSC :- UBIN0532240.
  Tender submitted without EMD will be rejected.
- **LETTER OF INTEREST** :- Eligible Contractors are required to send the Sugar Factory their letter of interest with credentials, only after approval of which registration for tender will be further processed.
- **LAST DATE FOR SUBMISSION OF OFFERS** :- **31.12.2020 upto 17.00 Hrs**. hard copy at the Karkhana Office, Sonai & Online on Portal.

The Management reserves the right to issue Blank Tenders, accept, reject, any or all the tenders without assigning any reason.

(S.S. Belhekar) **Managing Director** **(B.N. Mote)** **Vice-Chairman** **(N.K. Tuwar)** **Chairman**

2 INSTRUCTIONS FOR TENDER

The tender should be submitted in two separate envelopes / parts as under:-

A) **Envelope No. 1 / Part 1 in sealed cover** should contain the following documents only;

1) Covering letter clearly indicating the documents attached therein. In case the contractor desires to submit the tender with any condition etc., these conditions should also be submitted in the First cover.

2) Original copy of Earnest money deposit (EMD) of any Nationalized Bank Only.

3) Certificate of registration as approved contractor in the appropriate class or True copy duly attested.

4) All up to-date and valid Income-Tax clearance certificates in original or true copy duly attested

5) A list of work tendered for and in hand along with the true copy of the work order duly attested as per the Statement I enclosed.

6) A list of works of similar type and magnitude carried out by the tenderer, in last three years period as per the Statement II enclosed

7) A list of Plant and Machinery immediately available with the tenderer for use on this work as per the statement III enclosed

8) Details of technical persons who will be exclusively spared for this work by the tenderer as per the Statement IV enclosed

9) For Partnership Firm, the tenderer shall attach copy of the partnership deed and power of attorney should be attached.

10) No Deviation Letter as per the format enclosed

B) **Envelope No. 2 in sealed cover / Part 2** should contain the following document only;

1) Duly filled, sealed & signed original copy of Schedule "B" of tender

Both the sealed envelopes should together be submitted to the client, at the place and address as mentioned in the Tender Notice and E Copies to be uploaded to the Website as mentioned in the tender notice.

Omission to attach any above document is likely to invalidate the tender.

2.1 STATEMENT NO. I

DETAILS OF THE WORK TENDERED FOR AND IN HAND AS ON THE DATE OF SUBMISSION OF THIS TENDER

NAME OF THE TENDERER:-

SR. NO.	NAME OF THE WORK	PLACE & COUNTRY	WORKS IN HAND			WORKS TENDERED FOR			REMARKS
			TENDERED COST	COST OF REMAINING WORK	ANTICIPATED DATE OF COMPLETION	ESTIMA-TED COST	DATE WHEN DECISION IS EXPECTED	STIPULATED DATE OR PERIOD OF COMPLETION	
1	2	3	4	5	6	7	8	9	10

SEAL AND SIGNATURE OF THE CONTRACTOR

2.2 STATEMENT NO. II

DETAILS OF THE WORKS SIMILAR TYPE AND MAGNITUDE CARRIED OUT BY THE CONTRACTOR

NAME OF THE TENDERER:-

SR. NO.	NAME OF THE WORK	COST OF THE WORK	DATE OF STARTING	STIPULATED DATE OF COMPLETION	ACTUAL DATE OF COMPLETION	REMARKS
1	2	3	4	5	6	7

SEAL AND SIGNATURE OF THE CONTRACTOR

2.3 STATEMENT NO. III

DETAILS OF PLANT AND MACHINERY IMMEDIATELY AVAILABLE WITH THE TENDERER FOR THIS WORK

NAME OF THE TENDERER:-

SR. NO.	NAME OF THE EQUIPMENT	NO. OF UNITS	KIND & MAKE		CAPACITY	AGE & CONDITION		PRESENT LOCATION	REMARKS
1	2	3	4	5	6	7	8	9	10

SEAL AND SIGNATURE OF THE CONTRACTOR

2.4STATEMENT NO. IV

DETAILS OF TECHNICAL PERSONNEL AVAILABLE WITH THE CONTRACTOR

NAME OF THE TENDERER:-

SR. NO.	NAME OF THE PERSON	QUALIFICATION	WHETHER WORKING IN FIELD /OFFICE	EXPERIENCE OF EXECUTION OF SIMILAR WORKS	PERIOD FOR WHICH THE PERSON IS WORKING WITH TENDERER	REMARKS
1	2	3	4	5	6	7

SEAL AND SIGNATURE OF THE CONTRACTOR

2.5 FORMAT OF NO DEVIATION LETTER

(On Bidders Letter Head)

Ref No. : **Date:**

To,

THE MANAGING DIRECTOR
MULA S.S.K LTD.
P.O :- Sonai, Tal :- Newasa
Dist :- Ahmednagar 414 105.

Subject: Declaration of No Deviation for Technical & Commercial Bid Submission for Civil tender for **DISTILLERY AND INCINERATION BOILER CIVIL WORKS**

Dear Sir,

We refer the tender document for above package, queries raised by us & clarifications received, discussion during pre-bid meeting held on _____ & MOM of Pre-bid Meeting.

We hereby confirm that, there are no commercial & technical deviations in our bids & our bids shall comply with the tender ( ) documents, clarifications & MOM of Pre-bid meeting.

Regards,

(Authorized signature)

3. CONDITIONS OF TENDER

CONTENTS

3.1	Tender Letter
3.2	Instructions or Notice to Contractor
3.3	Articles of Agreement
3.4	General Conditions of Tender
3.5	Appendix Hereinbefore referred to
3.6	Special Conditions of Tender (A)
3.7	Special Conditions of Tender (B)
3.8	Price Variation Clause
3.9	Bid Capacity of Contractor

ARCHITECTURAL- STRUCTURAL
CONSTRUCTION PLANNING
& PROGRAMMING

OPP. RAJIV GANDHI BHAVAN, SHARANPUR ROAD,
NASHIK 422 002. MAHARASHTRA (INDIA)
PHONE : OFFICE : 2581016, RES. : 2575303
FAX NO. 91-253-2573331.
Email :- nspatil_nsk@yahoo.com

3.1. Tender Letter

To,

THE MANAGING DIRECTOR
MULA S.S.K LTD.
P.O :- Sonai, Tal :- Newasa
Dist :- Ahmednagar 414 105.

Dear Sir/s,

I / we have read and understood and gone through the following documents relating to the construction of **DISTILLERY AND INCINERATION BOILER CIVIL WORKS** for **MULA S.S.K.LTD.**

a) Notice Inviting Tender.
b) Form of Tender and Articles of Agreement.
c) General conditions of contract Cl. No. 1 To Cl. No. 58
d) Condition of Contract Pg. 1 to Pg. 48
e) Appendix Hereinbefore Referred To
f) General and Special conditions of Tender, Annexure 'A' & 'B' & Annexure for Price Variation Clause, Bid Capacity of Contractor.
g) Construction specifications, section I to section XV.
h) Prevailing I. S. standards / Equivalent Standards and Maharashtra State Government specifications together with the latest amendments.
i) Schedule of Quantity with Respective Rates and Units, Notes, Schedule 'A' (if any)
j) Drawings, As Available with The Architect's office, Nashik.

I/We hereby tender for the execution of the works referred to in the aforesaid documents upon the terms and conditions contained or referred to therein and in accordance in all respects with the specifications, designs, drawings and other relevant details.

2) As per the Rates in the schedule of Quantity and within the period(s) of completion as stipulated in the Tender Notice (4months from the date of Work Order / Agreement, whichever is earlier).

In consideration of I/We being invited to tender, I/we agree to keep the tender open for acceptance for NINETY DAYS from the due date of submission thereof and not to make any modifications in its terms and conditions, which are not acceptable.

A sum of Rs. (AS PER TENDER NOTICE), is hereby forwarded in Demand Draft / Bank Guarantee of a Nationalized Bank as the earnest money. If I/we fail to keep the tender open as aforesaid or make any modifications in the terms and conditions of the tender which are not acceptable, I/we agree that the Owner/Employer of work shall, without prejudice to any right or remedy, be at the liberty to forfeit the said

earnest money absolutely. Should this tender be accepted, I/we agree to abide by and fulfill all the terms, conditions and provisions of the aforesaid document.

If, after the tender is accepted, I/we fail to commence the execution of the works as provided in the conditions, I/we agree that owner/Employer of work shall without prejudice to any other right or remedy, be at LIBERTY TO FOREFEIT THE SAID EARNEST MONEY ABSOLUTELY.

Witness_____ Signature _____

Date_____ Duly authorized to sign
the tender on behalf of

Address_____ _____

_____

Date _____

Postal Address _____

_____

Telephone No._____

3.2. NOTICE TO CONTRACTORS

Messers

_____

_____
_____

Project **DISTILLERY AND INCINERATION BOILER CIVIL WORKS FOR MULA SSK LTD.**
P.O :- Sonai, Tal :- Newasa, Dist :- Ahmednagar 414 105.

Dear Sirs,

1. M/s.**MULA SSK LTD.,**have pleasure in inviting you to tender for the aforesaid work.

2. Sealed tenders should be addressed to **THE MANAGING DIRECTOR, MULA SSK LTD,** P.O :- Sonai, Tal :- Newasa, Dist :- Ahmednagar – 414 105,and subscribed "Tender for the proposed **"DISTILLERY AND INCINERATION BOILER CIVIL WORKS,"** and to the address as per tender notice not later than 17.00 Hrs. on 31.12.2020 and/or as per tender notice.

3. Drawing and designing or any other details may be inspected in our office on any working day during normal working hours.

4. The tenderer shall obtain on his own responsibility and at his own expenses all the information which may be necessary for the purpose of filling this tender and for entering into a contract for the purpose of filling this tender and for entering into a contract for the execution of the work and must examine and inspect the necessary drawings, site of work, source of supply of raw-materials and acquaint himself with all the local conditions and matters prevailing thereto.

5. Each of the tender documents is required to be signed by the person or persons submitting the tender in token of his/their having acquainted himself/themselves with the general conditions, specifications, special conditions etc. as laid down. Any tender with any of the documents not so signed will be rejected.

6. The tender form must be filled in English and all the entries must be made by hand and written in ink. If any of the documents is missing or unsigned, the tender shall be considered invalid.

7. All erasures and alterations made while filling the tender must be attested by initials of the Tenderer. Over writing of figures is not permitted. Failure to comply with either of these conditions will render the tender void. No advice or any change in rate or conditions after the sending of the tender will be entertained.

8. The intending tenderer shall deposit with the client Rs. (AS PER TENDER NOTICE),,the earnest money as a guarantee of good faith, which amount, shall be forwarded as liquidated damages, in the event of any evasive, refusal or delay in signing the contract. The deposit of the unsuccessful tenderers will be returned without interest, immediately after a decision is taken regarding the award of the contract.

   The Earnest money of the successful tenderer will be adjusted towards security deposit. A tender not accompanied by Earnest money deposit will not be considered.

9. The earnest money deposit Rs. (AS PER TENDER NOTICE),paid by the successful tenderer at the time of submitting this tender, shall be treated as a part of security deposit for due execution and fulfillment of the contract and will not bear any interest.

10. Within one week of the receipt of intimation from the Architect or the client of the acceptance of his/their tender, the successful tenderer shall be bound to implement the contract by signing an agreement in accordance with the Agreement and conditions of contract attached herewith, but the

written acceptance by the Employer of a tender will constitute a binding agreement between the Employer and the person so tendering, whether such formal contract is or not subsequently entered into.

11. In addition to the money paid under para 8-above, and as further security for the due fulfillment of the contract, Four Percent of the value of the work done, will be deducted from each payment to the contractor. On the Architect's certifying to the completion of the work, the contractor would be paid fifty percent of the security deposit and the remaining fifty percent will be retained for a further period of 12 months or as per Appendix - V, after the completion certificate is issued by the Architects.

12. All compensations or other sums of money payable by the contractor to our clients under the terms of this contract, may be deducted from the Security Deposit from any sum or sums that may be or may become due to the contractor on any account whatsoever and in the event of the security deposit being reduced by reason of any such deductions, the contractor shall within 15-days of being asked to do so, make good in cash or cheque any sum or sums which may have been deducted from his security deposit.

13. Our Clients will arrange for the permits and authorisations, if any, required for controlled materials in accordance with the prevailing regulations and will send them over to the contractors, who will place orders with the suppliers, collect the same at their own cost and store them in their godown at the site of construction and also bear all the expenses incurred in connection therewith, including payment of Taxes, Cess, octroi etc. The contractors will, however, not be entitled for any other materials, (except if mentioned in schedule 'A' of the Tender), required for the construction and which shall be arranged for by the contractor.

14. Our clients are not concerned with any rise or fall in the prices of any materials. The rates quoted shall include all costs, allowance, taxes or any other charges including any enhanced labour rates etc., which may by enacted from time to time by the state and/or Central Government. Under no circumstances shall our clients be held responsible for compensation or loss to the contractor due to any increase in the cost of labour or materials etc.

15. The rates quoted by the contractor shall include all eventualities such as heavy rain, sudden floods etc., which may cause damages to the executed work or which may totally wash out the work, until the completion certificate is issued to the contractors. Our clients will not be responsible for such damage or wash out of the construction.

16. In case where the same item of work is mentioned at one or more places in the Schedule of Quantities, the lowest of the rates quoted by the contractor, for the item, shall be taken for the payment of this item.

17. Time is the essence of the contract. The work should be completed in (refer clause of special conditions of contract and tender notice), from the date of the work order issued to the contractor to commence the work. The successful contractor will have to give a schedule of various items of work to be done so that the work gets completed within the stipulated time.

18. If the contractor fails to complete the work by the scheduled date of completion or within any sanctioned extended time, he will have to pay INR/USD/Equivalent per week (as mentioned in Appendix herein before referred to), as liquidated damage for each week beyond the date that the works remain incomplete, subject to clause laid in General conditions of contract.

19. **The tender should be submitted in two separate envelopes / Parts as under** :-

A) **Envelope No. 1 in sealed cover / PART 1** should contain the following documents only.

1) Forwarding letter clearly indicating the documents attached therein. In case the contractor desires to submit the tender with any condition etc., these conditions should also be submitted in the First cover.

2) Details of Earnest money deposit with the challan or original deposit at call receipt of Schedule Bank.

3) Certificate of registration as approved contractor in the appropriate class or True copy duly attested.

4) All upto-date and valid Income-Tax clearance certificates in original or true copy duly attested.

5) Details of works of similar type and magnitude carried out by the tenderer, in last three years period.

6) Details of works in hand along with the true copy of the work order duly attested.

7) Details of Plant and Machinery immediately available with the tenderer for use on this work.

8) Details of technical persons who will be exclusively spared for this work by the tenderer.

9) For Partnership Firm, the tenderer shall attach copy of the partnership deed and power of attorney should be attached.

B) **Envelope No. 2 in sealed cover / Part 2** should contain the tender itself. Both the sealed envelopes / Parts should together be submitted to our client, at the place and address as published in the Tender Notice and the E Tender Offers shall be uploaded to the above mentioned website / address.

20) The Quantities contained in the schedule are estimated, but may be more or less. The work as actually carried out and executed from time to time will be measured up, for which payment will be made subject to the terms and conditions of the contract.

21. The work on hourly labour charges, if any, shall be undertaken only after prior consent from the Architects. The charges therefore shall be based on the record sheet containing the names of persons so engaged and endorsed by the clerk of works. The labour sheet record mentioned above shall be presented daily for confirmation.

22. The unit prices shall be deemed to be fixed prices. In case of extra items, a record of labour charges paid shall be maintained and shall be presented regularly to the Architect for checking. The settlement will be made based on the figures arrived at jointly and taking unit prices given in the contract assigned to the successful Tenderer.

23. The Articles of Agreement of the contract are attached herewith.

24. The tenderer shall enter in the blank space of the last page provided in the Schedule of Quantity, the percentage in figures and also in words and score out one out of the words "Below/Above" as necessary, under his attestation. For Item Rate Tenders, the tenderer shall fill up both in words and figures, the rate/s against each Schedule of Item and the total of the amount/s of all the Schedule of Items on the last page. In case there is a difference between percentage written in figures and words, the lower offer will be taken as final.

25. No pages should be removed from, added in or replaced in the Tender.

26. Tenders which do not fulfill all or any of the conditions or are incomplete in any respect are liable to rejection.

27. The notice inviting tender, forms part of the tender agreement.

28. Our clients do not bind themselves to accept the lowest or any tender and reserve to themselves the right to accept or reject any or all tenders, either in whole or in part, without assigning any reasons.

(Contractor)	**NINAD S. PATIL** **Architect**	**YUGANDHAR N.PATIL** **M.E. (STRUCT) USA**	**SHIVAJI D. PATIL. FIE** **M.S. (U.S.A.)** Consulting Architect Engineer, Nashik 422 002.

3.3. ARTICLES OF AGREEMENT

made the _____ date of _____ of _____
between **THE MANAGING DIRECTOR, MULA SSK LTD**, P.O :- Sonai, Tal :- Newasa, Dist :- Ahmednagar 414 105.

hereinafter called "the Owner/Client") of the one part and.

_____

_____

_____

of (or whose registered office is situate at) :-

_____

_____

_____

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

WHEREAS the Owner/Client is desirous of constructing the **DISTILLERY AND INCINERATION BOILER CIVIL WORKS,** (hereinafter called "the work") at **MULA SSK LTD.,**P.O :- Sonai, Tal: - Newasa, Dist: - Ahmednagar – 414 105.

and has caused Drawings and Bills of Quantities showing and describing the work to be done to be prepared by or under the direction of. Mr. Shivaji D.Patil, Mr. Ninad S.Patil, Mr. Yugandhar N.Patil, Consulting Architect Engineers, Nashik

AND WHEREAS the Contractor has supplied the owner with a fully priced copy of said Bill of Quantities (which copy is hereinafter referred to as "the Contract Bills") and WHEREAS the said Drawings (hereinafter referred to as "the Contract Drawings") and the Contract Bills have been signed by or on behalf of the parties hereto

AND WHEREAS the contractor has deposited 2% of contract value, which is the sum of (a) Rs. 9,48,786/- for Admin, Power House, Boiler Etc., (b) Rs.9,92,365/- for Distillation and Fermentation Section, (c) Rs.6,32,869/- for Evaporation and Storage Section and (d) Rs. 2,21,512/- for RCC Chimney and Foundation with the Owner as security deposit against this Agreement.

NOW IT IS HEREBY AGREED AS FOLLOWS :-

1. For the consideration hereinafter mentioned, the contractor will upon and subject to the conditions annexed, carry out and complete the work shown upon the Contract Drawings and described by or referred to in the Contract Bills and in the said conditions.
2. The owner will pay the contractor the sum of INR/USD/Equivalent as per the amount due as per the Running and Final Bills of the Civil Contractor minus any deductions (hereinafter referred as "the contract sum") or such other sum as shall become payable hereunder at the times and in the manner specified in the said conditions.
3. The term "the Architect" in the said conditions shall mean the said Shivaji D. Patil, M.S. (U.S.A.) Consulting Architect Engineer, Nasik City, Mr. Ninad Shivaji Patil, Architect, Mr. Yugandhar Ninad Patil, M.E, or in the event of their death or ceasing to be the Architects for the purpose of this contract, such other person as the Owner shall nominate for the purpose, not being a person to whom the contractor shall object for reasons considered to be sufficient by an arbitrator appointed in accordance with the said conditions. Provided always that no person subsequently appointed to be the Architect under this contract shall be entitled to disregard or overrule any certificate or opinion or decision or approval or instruction given or expressed by the Architects for the time being.

4. The said condition and appendix thereto shall be read and constituent as forming part of this Agreement, and the parties hereto shall respectively abide by, submit themselves to the conditions and perform the agreements on their parts respectively in such conditions contained.

AS WITNESS our hand this _____ day of _____20 _____

Signed by the said
in the presence of

Owner

1. Witness :

Name :

Address :

Signed by the said in
the presence of

Contractor

2. Witness :

Name :

Address :

3.4. GENERAL CONDITIONS OF CONTRACT

1.1 **DEFINITIONS:-** The contract document consists of the Agreement, the General Conditions of the contract, specifications, bills of quantities, including all modifications thereof incorporated in the document before the execution of work, and the Contract Drawings prepared by the Architect from time to time. These form the contract.

1.2 The Owner/Client : As per the Articles of Agreement.
The Contractor : As per the Articles of Agreement.
The Architect : Shivaji D. Patil, FIE, M.S. (U.S.A.), Nashik, Mr. Ninad S. Patil, Mr. Yugandhar N.Patil, Nashik.
The Consultant : Shivaji D. Patil, FIE, M.S. (U.S.A.), Mr. Ninad S.Patil, Mr. Yugandhar N.Patil, Nashik.

Are those mentioned as such in the Agreement and shall include their legal representatives, assigns or successors. They are treated throughout the Contract Document as if each were of the singular number and masculine gender.

1.3 "The Site" shall mean the site of the contract work including any building and erections thereon and any other land allotted by the owner for the contractor's use.

1.4 The term "Sub-Contractor", as employed herein, includes those having a direct contract with the Contractor and it includes one who furnishes material worked to a special design according to the plans or specifications of this work but does not include one who merely furnishes material not so worked.

Any one doing work on a piece rate basis shall be deemed a sub-contractor.

1.5 Written notice shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an office of the corporation for whom it is intended or if delivered at or sent by registered mail to the last business address known to him who gives the notice.

1.6 The term "Work" of the contractor or sub-contractor includes labour or material or both.

1.7 The time limits stated in the Contract Document are the essence of the contract.

1.8 The law of the place of work shall govern the construction under this contract.

1.9 The date of virtual completion of a project or specified area of a project is the date when construction is sufficiently completed, in accordance with the Contract Documents as modified by any change or variation orders agreed to by the parties, so that the Owner can occupy the project for the use it was intended.

2.0 **CONTRACT DOCUMENT :-**

The following documents shall constitute the contract document :-

i. Articles of Agreement
ii. General Conditions of Contract
iii. Specifications.
iv. Bills of Quantities (Schedule of Quantity)

The contract Document is complementary. What is called for in any one shall be as binding as if called for by all.

The contract Document shall remain in the custody of the owner so as to be available at all reasonable times for the inspection of the contractor. Immediately after the execution of the contract, one copy of the contract

document and one copy of the contract drawings shall without charge be supplied by the Architect to the contractor and one copy of Contract Document to the owner.

So soon as is possible after execution of this contract, one copy of the Specifications, Descriptive schedules or other like document shall impose any obligation beyond those imposed by the Contract Document namely by the Contract Drawing, the Contract Bills, the Articles of Agreement and these conditions.

Providing that nothing contained in the said Specification, Descriptive schedule or other document shall impose any obligation beyond those imposed by the Contract Document namely by the Contract Drawing, the Contract Bills, the Articles of Agreement and these conditions.

After the award of the contract, the contractor shall without charge be supplied with all such further drawings and details as may be prepared by the Architect and his Consultant, from time to time as the work proceeds as are reasonably necessary either to explain or amplify the contract drawings or to enable the contractor to carry out and complete the work in accordance with these conditions. Provided all such drawings shall be a reasonable development of the work described in the Contract Document.

The contractor shall keep a copy of the specifications, descriptive schedule or other like document referred to this clause and copy of the contract drawings and such other drawings and details supplied to him from time to time and referred to in this clause and written instructions referred to in clause and sub-clause upon the site so as to be available to the Architect or his representative at all reasonable times.

None of the documents hereinbefore mentioned shall be used by the contractor for any purpose other than this contract and neither the Owner nor the Architect shall develop or use, except for the purpose of this contract, any of the prices in the contract bills.

Upon final certificate/semi-final bill under the clause 31(6) of these conditions, the contractor shall if so requested by the Architect, forthwith return to the Architect, all Drawings, Details, Specifications, Descriptive schedule and other documents of like nature, which bears his name or that of the Consultant.

3.0 **TYPE OF CONTRACT:-** The contract shall be an item-rate or percentage rate contract or Lump Sum. The contractor shall be paid for the actual quantity of work done, as measured at site, at the rates agreed upon by him in the Contract Bills.

4.0 **SCHEDULE OF QUANTITIES:-** The Schedule of Quantities given in the Contract Bill are provisional and are meant to indicate the intent of the work and to provide a uniform basis for tendering. The Owner reserves the right to increase or decrease any of the quantities or to totally omit any item of work and the contractor shall not claim any extras or damages on these grounds, up to 25% of the contract cost.

Any error in description or in quantity or omission of items from the contract bills, shall not vitiate this contract, but shall be treated as a variation.

5.1 **CONTRACT DRAWINGS:-** In general the Drawings shall indicate dimensions, position and type of construction, the specifications shall indicate the qualities and the methods and the bill of quantities shall indicate the quantum and the rate for each item of work. Any work indicated on the drawings and not mentioned in the specification or vice versa, shall be furnished as though fully set forth in both. Work not specifically detailed, called for, marked or specified, shall be the same as similar parts that are detailed, marked or specified.

5.2 The Contractor's work shall not deviate from the Drawings and the Specifications. The Architect's interpretation of these documents shall be final and without appeal.

5.3 Errors or inconsistencies discovered in the drawings and specifications shall be promptly brought to the attention of the Architect, through the clerk of works, for interpretation or correction. Local conditions which may affect the work shall likewise be brought to the Architect's attention. If at any time, it is discovered that the work is being done which is not in accordance with the Contract Drawings and Specifications, the contractor shall correct the work immediately. Correction of defective work shall not be a basis for any claim for extension of time. The contractor shall not carry on work except with the knowledge of the clerk-of-works.

5.4 Figured dimensions on the scale Drawings and large size details shall govern. Large size details shall take precedence over small scale drawings. Any work done before receipt of such details, if not in accordance with the same, shall be removed and replaced or adjusted as directed, by the contractor, without extra cost to the Owner. The general conditions apply with equal force to all the work including authorised extra works.

5.5 All drawings, bills of quantities and specifications and copies thereof furnished by the Architect are his property. They shall not be used on any other work and shall be returned to the Architect at his request on completion or termination of the contract.

5.6 **SHOP DRAWINGS:-** Reinforcing steel bar bending schedules and structural fabrication shop drawings and details shall, if requested by the Architect, be furnished to the Architect, by the contractor at least fifteen days prior to the fabrication, cutting and bending of reinforcement, and fabrication of the structural steel work. The drawings shall be got approved from the Architect prior starting the work.

6.0 **CONTRACT SUM:-** The contract sum shall not be adjusted or altered in any way whatsoever otherwise than in accordance with the express provisions of these conditions, and subject to clause 5 (2) of these conditions. Any error whether of arithmetic nature or not in the computation of the contract sum, shall be deemed to have been accepted by the parties hereto.

7.1 The quality and quantity of the work included in the contract sum, shall be deemed to be that which is set out in the contract bills, which bills unless otherwise expressly stated in respect of any specified item, shall be deemed to have been prepared in accordance with the principles of the standard method of measurement of building works, last before issued by the Indian/Equivalent Standard Institution, but same as aforesaid, nothing contained in the contract bills shall override, modify or affect in any way whatsoever the application or interpretation of that which is contained in these conditions.

7.2 Any error in description or in quantity or omission of items from the contract bills shall not vitiate this contract but shall be corrected and deemed to be a variation required by the Architect.

8.1 **SCOPE AND INTENT:-** SCOPE : The General character and the scope of the work is illustrated and defined by the specifications and the bills of quantities herewith attached and by the signed Drawings. If the contractor shall find any discrepancy in or divergence between the Contract Drawings and/or the Contract Bills, he shall immediately give to the Architect a written notice specifying the discrepancy or divergence and the Architect shall issue instructions in regard thereto.

8.2 EXTENT : The contractor shall carry out and complete the work in every respect in accordance with this contract and with the directions of and to the reasonable satisfaction of the Architect. The Architect may in his absolute discretion and from time to time, issue further drawings, details and/or written instructions, written directions and written explanations, all of which are collectively referred to as Architect's instructions. All such Drawings and instructions shall be consistent with the contract document, true developments thereof and reasonable therefrom.

8.3 INTENT : The intention of the document is to include all labour and materials, equipment and transportation necessary for the proper execution of the work. All such drawings and instructions shall be consistent with the contract document, true developments thereof and reasonable inferable therefrom. Materials of work described in words which so applied, have a well known technical or trade meaning, shall be referred to such recognized standards.

9.1 **ARCHITECT'S INSTRUCTIONS:-** The contractor shall forthwith comply with and duly execute any works comprised in such instructions issued to him by the Architect in regard to any matter in respect of which the Architect is expressly empowered by these conditions to issue instructions, provided always that verbal instructions, directions, and explanations given to the contractor or his work representative by the Architect, shall if involving a variation, be confirmed in writing.

If within seven days after receipt of a written notice from the Architect, requiring compliance with an instruction, the contractor does not comply herewith, then the Owner may employ and pay other persons to execute any work whatsoever which may be necessary to give effect to such instructions and all cost incurred with such employment shall be recoverable from the contractor by the owner as a debt or may be deducted by him from any monies due or to become due to the contractor under this contract.

9.2 Upon receipt of what purports to be instruction issued to him by the Architect, the contractor may request the Architect to specify in writing the provision of these conditions which empowers the issue of the said instruction. The Architect shall forthwith comply with any such request, and if the contractor shall thereafter comply with the said instruction, then the issue of the same shall be deemed for all purposes of this contract to have been empowered by the provision of the conditions specified by the Architect in answer to the contractor's request.

9.3 All instructions issued by the Architect shall be in writing. Any instruction issued orally shall be of immediate effect, but shall be confirmed in writing by the contractor to the Architect within seven days, and if not dissented from in writing by the Architect to the contractor within seven days from receipt of the contactor's confirmation, shall take effect as from the expiration of the later said seven days.

Provided Always

A) That if the Architect within seven days of giving such an oral instruction, shall himself confirm the same in writing, then the contractor shall not be obliged to confirm as aforesaid, and the said instruction shall take effect as from the date of the Architect's Confirmation and

B) That if neither the contractor nor the Architect shall confirm such an oral instruction in the manner and at the time aforesaid, but the contractor shall nevertheless comply with the same, then the Architect may confirm the same in writing at any time prior to the issue of the final certificate, and the said instruction shall thereupon be deemed to have taken effect on the date on which it was issued.

10. **FACILITIES AND CO-OPERATION:-** In the case of works indicated on the Drawings but not included in the contract, the contractor shall provide necessary facilities and co-operation for any sub-contractor or supplier who may be approved by the owner. The contractor shall do all cutting, filling or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors shown upon or reasonably implied by the drawings and specifications for the completed structure and shall be borne by the party responsible therefore.

The contractor shall not endanger any work by cutting, excavating or otherwise altering the work and shall not cut or alter the work of any other contractor, save with the consent of the Architect.

11. **SETTING OUT:-** The Architect shall determine any lines, levels which may be required for the execution of the work and shall furnish to the contractor such information as shall enable the contractor to setout the work at ground level.

The contractor shall set out and level the work and shall be responsible for the accuracy of the same. He shall provide all the instruments and attendance required by the Architect for checking the work. He shall entirely at his own cost amend to the satisfaction of the Architect any error found at any stage which may arise through inaccurate setting.

12.1 VISIT : Before tendering, the contractor shall have visited and examined the site and satisfied himself as to the nature of the existing roads or other means of communication and the character of the soil and of the excavations, the correct dimensions of the work and the facilities for obtaining any special articles called for in the Contract Document and shall have obtained generally his own information on all matters affecting the continuation and progress of the works.

No extra charge, made on consequence of any misunderstanding or incorrect information on any of these points, or on the ground of insufficient description, will be allowed. Should the contractor after visiting the site, find any discrepancies, omissions, ambiguities or conflicts in or among the contract Document, or to be in doubt as to their meaning, he shall bring the questions to the Architect's attention, not later than seven days before the last date for submission of the tender.

12.2 Possession : The contractor shall be allowed admittance to the site on the 'Date of Commencement' stated in the appendix and he shall thereupon and forthwith begin the work and shall regularly proceed with and complete the same on or before the "Date of Completion" stated in the appendix, subject nevertheless to the provision for extension of time hereinafter contained.

12.9 Treasures : Any Treasures, coins or objects of Antiquity, which may be found at site shall be handed over to the owner.

13.1 **SAMPLES AND SHOP DRAWING:-** After the award of the contract, the contractor shall furnish for the approval of the Architect, with such promptness as to cause no delay in his work or in that of any other sub contractor, samples and shop drawings required by the specifications or by the Architect. Samples shall be delivered as directed by the Architect.

13.2 A schedule giving dates for the submission of samples shall be included in the schedule described under clause 14.0. Unless specifically authorised, all samples must be submitted for approval within thirty days of signing the contract and not less than thirty days before the date the particular work involved is scheduled to begin.

13.3 The Architect shall check and approve such samples; with reasonable promptness only for conformity with the design concept of the project and for compliance with the information in the Contract Documents. The work shall be in accordance with the approved samples.

14.0 **PROGRESS CHART:-** The contractor shall prepare progress charts and submit the same for approval of the Architect and for his record. within twenty-one days of the Award of the Contract. The charts shall indicate the expected date of commencement and completion of each of the items of the work and shall be in the form approved by the Architect. The Chart shall also indicate the scheduling of samples, shop Drawings and approvals.

15.0 **ACCESS FOR ARCHITECT TO THE WORKS:-** The Architect and his representatives shall at all reasonable times have access to the works and to the workshops or other places of the contractor where work is being prepared for the contract and when work is to be so prepared in workshops or other places of a subcontractor (whether or not a nominated sub-contractor as defined in clause 26 of these conditions) the contractor shall have a term in the sub-contract so as to secure a similar right of access to those workshops or places for the Architect and his representatives and shall do all things reasonably necessary to make such right effective.

16.0 **ARCHITECT'S STATUS AND DECISION:-** The Architect shall be the owner's representative during the construction period. The Architect shall periodically visit the works to inspect the progress and the quality of the work and to determine in general if the work is proceeding in accordance with the Contract Document. He shall not be required to make exhaustive or continuous on site inspections to check the quality or quantity of the work and he shall not be responsible for the contractors failure to carry out the construction work in accordance with the Contract Document. During such visits and on the basis of his observations while at the site, he shall keep the owner informed of the progress of the work, shall endeavor to guard the owner against defects and deficiencies in the work of the contractor and he shall condemn work which fails to conform to the Contract Document. He shall have authority to act on behalf of the owner only to the extent expressly provided in the Contract Document or otherwise in writing which shall be shown to the contractor. He shall have authority to stop the work whenever such stoppage may be necessary, in his reasonable opinion to ensure the proper execution of the contract.

16.1 The Architect shall be in the first instance the interpreter of the conditions of this contract and the judge of its performance. He shall side neither with the owner nor with the contractor but shall use his powers under the contract to enforce its faithful performance by both. In case of the termination of the appointment of the Architect, the owner shall appoint a capable and reputable Architect against whom the contractor shall make

no reasonable objection and whose status under the contract shall be that of the former Architect. Any dispute in connection with such appointment shall be subject to Arbitration.

16.2 Decision : The Architect shall within a reasonable time make decisions on all claims of the owner or the contractor and all other matters relating to the execution and progress of the work or the interpretation of the Contract Document.

The Architect may in his absolute discretion, from time to time, issue further Drawings, Details and/or written instructions, written directions and written explanations in regard to :-

A) Variation or modifications of the design.

B) The quality or quantity of works or the additions or omission or substitution of any work.

C) Any discrepancy in or divergence between the Drawings and/or specifications.

D) The removal and/or re-execution of any works executed by the contractor.

E) The dismissal from the works of any person employed thereon.

F) The opening up for inspection of any work covered up.

G) The amending and making good of any defects under Defects liability period.

H) The removal from the site of any materials brought thereon by the contractor and the substitution of any other material therefore.

I) Assignment and sub-letting.

J) Delay and extension time.

K) The postponement of any work to be executed under the provision of this contract.

16.3 DISMISSAL : The contractor shall on the request of the Architect, immediately dismiss from the works any persons employed thereon by him, who may in the opinion of the Architect, be incompetent or misconducts himself, and such person shall not be again employed on the work without the permission of the Architect.

17.0 **PERFORMANCE BOND:-** Within ten days of the signing of this contract the contractor shall deposit with the Owner for due performance of this contract, as security deposit, a sum which together with the Earnest Money shall be equal to that referred to in the appendix to this contract as "Security Deposit".

The Security Deposit shall be in the form approved by the Architect and shall remain so deposited with the Owner till the end of the Defects Liability Period referred to in the appendix.

The said Security Deposit shall indemnify the owner against loss from defects arising from any clause under this contract or due to the failure of the contractor to promptly carry out any matters arising under this contract.

18.0 **CLERK OF WORKS**:- The term "Clerk of works" shall mean the person approved by the Architect and appointed and paid by the Owner and acting under the orders of the Architect, to inspect the works in the absence of the Architect. The contractor shall afford the clerk of works every facility and assistance for inspecting the works and materials and for checking and measuring item and materials. Neither the clerk of works nor any representative of the Architect shall have power to set out works or to revoke, alter, enlarge or relax any requirements of the contract or to sanction any day work, additions, alterations, deviations or omissions, or

any extra work whatever, except in so far as such authority may be specially conferred by a written order of the Architect..

The clerk of works or any representative of the Architect, shall have power to give notice to the contractor or to his representative, of non-approval of any work or materials and such work shall be suspended or the use of such materials shall be discontinued until the decision of the Architect is obtained. The works will, from time to time, be examined by the Architect, the clerk of works or the Architect's representative but such examination shall not in any way exonerate the contractor from the obligation to remedy any defects which may be found to exist at any stage of the works or after the same is completed, subject to the limitation of this clause. The contractor shall take instructions only from the Architect.

19.1 **CONTRACTOR'S FIELD ORGANISATION AND EQUIPMENT:-**

ENGINEER-IN-CHARGE: The contractor shall constantly keep on his work during its progress, one or more qualified and competent Engineer-in-charge who will be responsible for the carrying out of the works to the true meaning of the Drawings, Specifications and schedule of Quantities. Architects instructions given to him by the Architect shall be deemed to have been issued to the contractor. Attention is called to the importance of requesting instructions from the Architect before undertaking any work where Architect's directions or instructions are required. Any such work done in advance of such instructions will be liable to be removed.

19.2 Equipment : The contractor shall provide and install all necessary hoists, ladders, scaffolding, tools, tackles, plants, all transport for labour, material and plant, necessary for the proper carrying on, execution and completion to the satisfaction of the Architect.

19.3 Office Accomodation : The contractor shall provide, erect and maintain where directed, simple watertight office accomodation for the foreman and the clerk-of-works. This accomodation shall be well lighted and ventilated and provided with windows, doors with a lock and a Telephone. The clerk of works office shall be a minimum of 100 sft. and shall have a desk, chair and drawers for keeping drawings and tack board for displaying drawings. The accomodation to be demolished when directed.

19.4 Watchman : The contractor shall make his own security arrangement to guard the site and premises at all times, at his own expense. The security arrangements shall be adequate to maintain strict control on the movement of material and labour. The contractor shall extend the security arrangements to guard the material stored and/or fixed on the premises by the sub-contractors.

19.5 Storage and Materials : The contractor shall provide, erect and maintain proper sheds for the storage and protection of the materials etc and also for the execution of work which may be prepared on the site.

19.6 Sanitary conveniences : The contractor shall provide and erect all necessary sanitary convenience for the site staff and the workmen, maintain it in a clean orderly condition and clean and defectwise the ground after removal.

19.7 Telephone: The contractor shall provide a separate telephone for the works and shall pay all charges in connection with the same during the execution of the work.

19.8 Scaffolding, Staging, Guardrails: The contractor shall provide scaffolding, staging, guardrails, temporary stairs, which shall be required during construction. The support for the scaffolding, staging, guardrails and temporary stairs shall be strong, adequate for the particular situation. The temporary access to the various parts of the Building under construction shall be rigid and strong enough to avoid any chance of mishaps. The arrangement proposed shall be subject to the approval of the Architect.

20.0 **TAXES:-** The contractor shall add to the amount of his tender the amount of GST, sales tax, duty, Vat, Works contract tax, Service Tax, any other tax for octroi legally payable and his rates shall cover for all taxes and duties and no claim on this account will be entertained (Also refer Notes for the same).

21.1 **STATUTORY OBLIGATIONS, NOTICES, FEES AND CHARGES: -**The contractor shall comply with and give all notices required by any government authority and instrument, rule or order made under any Act of Parliament or any regulation or Byelaw of any local authority relating to the work or with whose system the same is or will be connected. The contractor before making any variation from the contract Drawings or contract Bills, necessitated by such compliance shall give to the Architect a written notice specifying and giving reason for such variations and the Architect may issue instructions in regard thereto. If within 10 days of having given the said written notice, the contractor does not receive any instructions in regard to the matters therein specified, he shall proceed with the work confirming to the Act of Parliament, instrument, rule, order, regulations or bye-law in question and any variation thereby necessitated shall be deemed to be a variation required by the Architect.

21.2 The contractor shall pay and indemnify the owner against liability in respect of any fees or charges (including any rates and taxes) legally demandable under any Act of Parliament, instrument, rule or order or any regulation or Bye-law of any local authority in respect of the work.

22. **ROYALTIES AND PATENT RIGHTS:-** All royalties or other sums payable in respect of the supply and use in carrying out the works as desired by or referred to in the Contract Bills of any patented articles, process or inventions, shall be deemed to have been included in the contract sum, and the contractor shall indemnify the owner from and against all claims, proceedings, damages, costs and expenses which may be brought or made against the owner or to which he may be put by reason of the contractor infringing or being held to have infringed any patent rights in relaxation to any such articles, processes, inventions.

23. **LICENCES AND PERMITS FOR MATERIALS UNDER GOVT. CONTROL:-** Licences and permits for all materials for under water service at the point indicated in the site plan, the contractor shall pay for all fees in connection with such services and shall pay the supply authority for all water used prior to the completion of the work. The contractor shall also provide any temporary service piping and taps as required for his use on the work, and remove the same on completion of work.

24. If the contractor proposes to make his own arrangement for the supply of water, other than from the supply authority, he shall furnish at his cost, the water analysis to the Architect for approval, before use in the building work.

25. **ASSIGNMENT OR SUB-LETTING:-** The contractor shall not, without the written consent of the Architect, assign this contract, and shall not, without the written consent of the Architect (which consent shall not be unreasonably withheld to the prejudice of the contractor), sublet any portion of the work.

26. **SUB-CONTRACTOR :-** As soon as practicable and before awarding any sub-contract, the contractor shall notify the Architect in writing the names of the sub-contractor proposed for the Principal parts of the work and for such other parts as the Architect may direct, and shall not employ any to whom the Architect or the owner may have a reasonable objection.

The Architect however, shall have power to obtain estimate and select other agencies to carry out any of the work as described below.

26.1 All specialists, merchants, tradesmen, and others executing any work or supplying and fixing any goods, who may be nominated or selected by the Architect, shall be deemed to be sub-contractors employed by the contractors and are to be referred as nominated sub-contractors. No nominated sub-contractor shall be employed, on or in connection with the work, against whom the contractor shall make reasonable objection or (save where the Architect and Contractor shall otherwise agree) who will not enter into a contract, provided:-

A. That the nominated sub-contractor shall carry out and complete the sub contract work in every respect to the reasonable satisfaction of the contractor and of the Architect and in conformity with all the reasonable directions and requirements of the contractor.

B. That the nominated sub-contractor shall observe, perform and comply with all the provisions of this contract on the part of the contractor, to be observed, performed and complied with (other than clause-47 (A) of these

conditions if applicable) so far as they relate and apply to the sub-contract works or to any portion of the same.

C. That the nominated Sub-contractor shall indemnify the contractor against the same liabilities in respect of the sub-contract work, as those for which the contractor is liable to indemnify the owner under this contract.

D. That the nominated sub-contractor shall indemnify the contractor against claims in respect of any negligence, mission or default of such sub-contractor, his servants or agents or any misuse by him or them of any scaffolding or other plant, and shall insure himself against any such claims and produce the policy, or policies and premium and premium receipts, as and when required by the contractor or the Architect.

E. That payment in respect of any work, materials or goods, comprised in the sub-contract, shall be made within fourteen days after receipt by the contractor of the Architect's certificate under clause 29 of these conditions (which states as due an amount calculated by including the total value of such work, materials or goods, and shall when due be subject to the retention by the contractor of the sums mentioned in sub-paragraph 'J').

F. That the Architect and his representative shall have the right of access to the workshops and other places of the nominated sub-contractor as mentioned in clause 15 of these conditions.

G. That the sub-contract work shall be completed within the period or (Where they are to be completed in sections) periods therein specified, that the contractor shall not, without the written consent of the Architect, grant any extension of time for the completion of the sub-contract work or any section thereof and the contractor shall inform the Architect of any representations made by the nominated sub-contractor as to the cause of any delay in the progress of completion of the sub-contract work or of any section thereof.

H. That if the nominated sub-contractor shall fail to complete the sub-contract work or (Where that sub-contractors works are to be completed in sections) any section thereof, within the period therein specified or within any extended time granted by the contractor with the written consent of the Architect, and the Architect certified in writing to the contractor, that the same ought reasonably so to have been completed, the nominated sub-contractor shall pay or allow to the contractor either a sum calculated at the rate therein agreed as Liquidated and Ascertained Damages for the period during which the said work or any section thereof, as the case may be, shall so remain or have remained incomplete or (where no such rate is agreed) a sum equivalent to any loss or damage suffered or incurred by the contractor and caused by the failure of the nominated sub-contractor as aforesaid.

J. That the contractor shall retain from the sum directed by the Architect, having been included in the calculation of the amount stated as due in any certificate issued under clause 31 of these conditions in respect of the total value of work, materials or goods executed or supplied by the nominated sub-contractor, the percentage of such value named in the appendix to these conditions, a percentage of certified value retained upto a total amount not exceeding a sum which bears the same ratio to the sub-contract price as the unreduced sum named in the appendix to these conditions as limit of Retention Fund bears to the contract sum; and that the contractor's interest in any sums so retained (by whomsoever held) shall be fiduciary as trustee for the nominated sub-contractor (but without obligation to interest); and that the nominated sub-contractor's beneficial interest in such sums shall be subject only to the right of the contractor to have recourse thereto from time to time for payment of any amount which he is entitled under the sub-contract to deduct from any sum due or to become due to the nominated sub-contractor, and that if and when such sums or any part thereof are released to the nominated sub-contractor, they shall be paid in full, if paid within fourteen days of the date fixed for their release in the sub-contract.

26.2 Before issuing any certificate under clause 31 of these conditions, the Architect may request the contractor to furnish to him reasonable proof that all amounts included in the calculation of the amount stated as due on previous certificates in respect of the total value of work, materials or goods executed or supplied by any nominated sub-contractor, have been duly discharged and if the contractor fails to comply with any such request, the Architect should issue a certificate to that effect and thereupon the owner may himself pay such amounts to the nominated sub-contractor concerned and deduct the same from any sums due to the contractor.

26.3A The contractor shall not grant to any nominated sub-contractor any extension of the period within which the sub-contract work or (where the sub-contract works are to be completed in sections) any section thereof is to

be completed, without the written consent of the Architect. Provided always that the contractor shall inform the Architect of any representation made by the nominated sub-contractor as to the cause of any delay in the progress or completion of the sub-contract work or any section thereof and that the consent of the Architect shall not be unreasonably withheld.

26.3B If any nominated sub-contractor fails to complete the sub-contract work or (where the sub-contract works are to be completed in sections) any section thereof within extended time granted by the contractor with the written consent of the Architect then if the same ought reasonably so to have been completed the Architect shall certify in writing accordingly. Any such certificates shall be issued to the contractor and immediately upon issue the Architect shall send a duplicate copy thereof to the nominated sub-contractor.

26.4 If the Architect desires to secure final payment to any nominated sub-contractor before final payment is due to the contractor, and if such sub-contractor has satisfactorily indemnified the contractor against any latent defects, then the Architect may in an Interim certificate, include an amount to cover the said final payment and thereupon the contractor shall pay such nominated sub-contractor the amount so certified. Upon such final payment, the amount named in the appendix to these conditions as limit of retention fund shall be reduced by the sum which bears the same ratio to the said amount as does such sub-contractor's sub-contract price to the contract sum, and save for latent defects, the contractor shall be discharged from all liability for the work, materials or goods executed or supplied by such sub-contractor under the sub-contract to which the payment relates.

26.5 Neither the existence not the exercise of the foregoing power not anything else contained in these conditions shall render the owner in any way liable to any nominated sub-contractor.

26.6 Where the contractor in the ordinary course of his business, directly carried out works for which Prime Cost or Provisional Sums are included in the Contract Bills and the Architect is prepared to receive tenders from the contractors for such items, then the contractor shall be permitted to tender for the same or any of them but without prejudice to the owner's right to reject the lowest or any tender. If the contractor's tender is accepted he shall not sublet the work without the consent in writing of the Architect.

26.7 It shall be a condition of any tender accepted under this paragraph, that clause 30 of these conditions shall apply in respect of the Item work included in the Tender, as if, for the reference therein to the contract Drawings and the contract Bills, there were references to the equivalent documents included in or referred to in the Tender.

26.8 The contractor shall allow for general attendance upon sub-contractors, including free use of plant scaffolding and is to allow them the use of sanitary conveniences, storage facilities for storing materials, other amenities and affording them all reasonable facilities for carrying out their contracts.

27.0 **PRIME COST :-** The following provisions of these conditions shall apply where Prime Cost sums are included in the contract Bills or arises as a result of Architect's instructions given in regard to the expenditure of provisional sums in respect of any materials or goods to be fixed by the contractor.

27.1 Such sums shall be understood to mean the net cost to be defrayed as a Prime Cost after deducting any trade or other discount and shall include sales tax (where applicable) and other taxes, duties and the cost of packing, carriage and delivery, provided that, where, in the opinion of the Architect, the contractor has incurred expenses for special packing or special carriage, such special expense shall be allowed as part of the sums actually paid by the contractor.

27.2 Such sums shall be expended in favour of such persons as the Architect shall instruct, and all specialists, merchants, tradesmen or others who are nominated by the Architect to supply materials or goods are hereby declared to be the suppliers to the contractor and are referred to in these conditions as "Nominated Suppliers", provided that the Architect shall not (save where the Architect and contractor shall otherwise agree) nominate as a supplier a person who will not enter into a contract of sale which provides (inter alia) :-

A. That the materials or goods to be supplied shall be to the reasonable satisfaction of the Architect.

B. That the nominated supplier make good by replacement or otherwise, any defects in the material or goods supplied, which appear within such period as is therein mentioned and shall bear any expenses reasonably incurred by the contractor as a direct consequence of such defects, provided that :-

i) Where the materials or goods have been used or fixed, such defects are not such that examination by the contractor ought to have revealed them before using or fixing.

ii) Such defects are due solely to defective workmanship of material in the goods supplied and shall not have been caused by improper storage by the contractor or misuse or by any act or neglect of either the contractor, the Architect or the owner, or by any person or persons for whom they may be responsible.

C. That delivery of the materials or goods supplied shall be commenced and completed at such times as the contractor may reasonably direct.

D. All payment by the contractor for materials or goods supplied by a Nominated Supplier shall be in full and shall be paid within 30 days of the end of the month during which the delivery is made.

28.0 **ARTISTS AND TRADESMAN :-** The contractor shall permit the execution of work not forming part of this contract by artists, tradesmen or others engaged by the owner. Every such person shall, for the purpose of clause 45 of these conditions, be deemed to be a person for whom the owner is responsible and not be a sub-contractor.

29.0 **SEPARATE CONTRACTS :-** The owner reserves the right to let other contract in connection with this work under similar general conditions. The contractor shall afford other contractors, reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs. If any part of contractor's or sub-contractors work depends for proper execution or result upon the work of any other contractor or sub-contractor, the contractor shall inspect and promptly report to the Architect any defects in such work that render unsuitable for such proper execution and results. Failure of the contractor to so inspect and report, shall constitute an acceptance of the other contractor's work as fit and proper for the reception of his work, except as to defects which may develop in the other contractor's or sub-contractor's work after the execution of his subsequent work. The contractor shall measure work already in place and shall at once report to the Architect any discrepancy between the executed work and the drawings.

30.1 **VARIATIONS PROVISIONAL :-** The Architect may issue instruction requiring a variation and he may sanction in writing any variation made by the contractor otherwise than pursuant to an instruction of the Architect. No variation required by the Architect or subsequently sanctioned by him, shall vitiate this contract.

30.2 The term "variation" as used in these conditions, means the alteration or modification of the design, quality or quantity of work as shown upon the contract Drawings and desired by or referred to in the contract bills, and includes the addition, omission or substitution of any work, the alteration of the kind of standard of any of the materials or goods to be used in the work, and the removal from the site of any work, materials or goods to be used in the work and the removal from the site of any works, materials or goods executed or brought thereon by the contractor for the purposes of the work, other than work, materials or goods which are not in accordance with this contract.

30.3 The Architect shall issue instructions, in regard to the expenditure of "PRIME COST" and Provisional Sums included in the contract Bills and of Prime Cost sums which arise as a result of instructions issued in regard to the expenditure of Provisional Sums.

*The term "PRIME COST" may be indicated by the abbreviation "P.C." in any document relating to this contract (including the contract Bills) and wherever the abbreviation is used it shall be deemed to mean "Price Cost".

30.4 All variations required by the Architect or subsequently sanctioned by him in writing and all work executed by the contractor, for which, Provisional Sums are included in the contract Bills (other than work for which a tender made under clause 26(7) of these conditions has been accepted) shall be measured by and valued by the Architect, who shall give to the contractor an opportunity of being present at the time of such

measurement and of taking such notes and measurements, as the contractor may require. The valuation of variations and of work executed by the contractor, for which a provisional sum is included in the contract Bills, (other than work for which a tender has been accepted as aforesaid) unless otherwise agreed, shall be made in accordance with the following rules :-

A. The price in the contract Bills shall determine the valuation of work of similar character, executed under similar conditions, as work priced therein.

B. The said prices, where work is not of a similar character or executed under similar conditions as aforesaid, shall be, on the basis of prices for the same, so far as may be reasonable, failing which a fair valuation thereon shall be made.

C. Where work cannot properly be measured and valued, the contractor shall be allowed day work rates on the prices prevailing when such work is carried out (unless otherwise provided in the contract bills) :

30.4. I At the rates if any, inserted by the contractor in the contract Bills or in the form of Tender or.

30.4. II When no such rates have been inserted, at the rates prevailing in the market for material and labour and at the control rates for the controlled materials, including in all cases, the rate for delivery of the material at the work.

Provided that, in any case specifying the time daily spent upon the work (and if required by the Architect, the workmen's names) and the materials employed, shall be delivered for verification to the Architect or his authorised representative not later than the end of the week, following that in which the work has been executed.

D. The prices in the contract Bills shall determine the valuation of items omitted, provided that if omissions substantially vary, the conditions under which any remaining items of work are carried out, the prices for such remaining items shall be valued under rule (b) of this sub-clause.

30.5 Effect shall be given to the measurement and valuation of variations, under sub-clause(4) of this condition, in Interim Certificate and by adjustment of the contract sum; and effect shall be given to the measurement and valuation of work for which a provisional sum is included in the contract Bills under the said sub-clause in Interim Certificate and by adjustment of the contract sum in accordance with clause 31(5) of these conditions.

30.6 If upon written application being made to him by the contractor, the Architect is of the opinion that a variation or the execution by the contractor of work for which provisional sum is included in the contract Bills (other than work for which a tender made under clause 26 (6) of these conditions has been accepted), has involved the contractor in direct loss and/or expense for which he would not be reimbursed by payment in respect of a valuation made in accordance with the rules contained in sub-clause (4) of the condition and if the said application is made within a reasonable time of the loss or expense having been incurred, then the Architect shall ascertain the amount of such loss or expenses. Any amount from time to time so ascertained, shall be added to the contract sum, and if an Interim Certificate is issued after the date of ascertainment, any such amount shall be added to the amount which would otherwise be stated as due in such certificate.

31.1 **CERTIFICATES AND PAYMENTS :-** At the period of Interim Certificate named in the appendix to these conditions, the Architect shall issue a certificate stating the amount due to the contractor from the owner, and the contractor be entitled to payment therefore, within the period for honouring certificates named in the appendix to these conditions. Interim valuations shall be made whenever the Architect considers them to be necessary for the purpose of ascertaining the amount to be stated as due in an Interim certificate.

31.2 The amount stated as due on Interim certificate, shall subject to any agreement between the parties as to stage payments, be the total value of the work properly executed and of the material and goods delivered to or adjacent to the work for use thereon, up to and including a date not more than seven days before the date of the said certificate, less any amount which may be retained by the owner (as provided in sub-clause (3) of the conditions) and less any installments previously paid under this condition, provided that such certificate shall only include the value of the said materials and goods as and from such time as they are reasonably, properly and not prematurely brought to or placed adjacent to the work and then only if adequately protected against weather or other casualties.

A. All intermediate payments shall be regarded as payments by way of advance against the final payments, only and not as payments for work actually done and completed, and shall not preclude the owner/architect from requiring any bad, un-sound, imperfect or unskillful work to be removed or taken away and re-constructed, or re-erected, nor shall any such payment be considered as an admission of the due performance of the contract or any part thereof in any respect, or the accruing of any claim, nor shall it conclude, determine or affect in any other way, the powers of the Architect as to the final settlement and adjustment of the accounts or otherwise, or in any other way vary or affect the contract.

B. In cases where the items of work are not accepted as so completed, the Architect may make payment on account of such items at such reduced rates as he may consider reasonable in the preparation of final or on running account bills.

C. The owner may retain the percentage of the total value of the work, materials and goods referred to in sub-clause (2) of this condition which is named in the appendix to these conditions, as retention percentage. Provided always that when the sum of the amounts so retained, equals the amount named in the said appendix, as limit of retention fund, or that amount as reduced in pursuance of clause 26 (J) of these conditions, as the case may be, no further amounts shall be retained by virtue of this sub-clause.

4. The amount retained by virtue of sub-clause (3) of this condition shall be subject to the following rules :-

A. The owner's interest in any amounts so retained shall be fiduciary as trustee for the contractor (but without obligation to invest), and the contractor's beneficial interest therein shall be subject only to the right of the owner to have recourse thereto from time to time for payment of any amount which he is entitled under the provisions of this contract, to deduct from any sum due or to become due to the contractor.

On issue of the certificate of virtual completion, the Architect shall issue a certificate for one of the total amounts then so retained and the contractor shall be entitled to payment of the said MOIETY within the period for honouring the certificate named in the appendix to these conditions.

5. A. The measurement and valuation of the work shall be completed within the period of final measurement and valuation stated in the appendix to these conditions, and the contractor shall be supplied with a copy of the period bills of variation not later than and of the said period and before the issue of the Final Certificate under sub-clause (6) of this condition.

B. Either before or within a reasonable time after virtual completion of the work, the contractor shall send to the Architect all documents necessary for the purpose of the computations required by these conditions, including all documents relating to the accounts of nominated sub-contractors and Nominated Suppliers.

C. Bill shall be submitted by the contractor each month on or before the date fixed by the Architect, for all the work executed in the previous month, and the Architect or his representative shall take or cause to be taken the requisite measurement for the purpose of having the same verified, and the claim, so far as it is admissible, shall be adjusted, if possible, within 15 days from the presentation of the bill to the Architect. If the contractor does not submit the bill, the Architect may depute his representative to measure up the said work in the presence of the contractor or his representative and the owner or his representative or his duly authorised agent whose countersignature to the measurement list shall be sufficient warrant, and the Architect may prepare a bill from such list which shall be binding on the contractor in all respects.

D. The contractor shall submit all bills in Triplicate on the standard forms to be had from Architect. The charges to be made in the bills shall always be entered at the rates specified in the tender or in the case of any work ordered in pursuance of these conditions, and not mentioned or provided for in the tender, at the rates of prevailing D.S.R. Schedule of rates of the Division as provided in P.W.D. or at the rates hereinafter provided for such work, whichever is lower.

E. In the settlement of accounts, the amounts paid or payable under the appropriate contracts by the contractor to nominated sub-contractors or nominated suppliers, the amounts paid or payable by virtue of clause for 21 (2) of these conditions in respect of fees or charges for which a provisional sum is included in the contract Bills. The amounts paid or payable in respect of any insurance maintained in compliance with clause 46 and 47 A, of these conditions, the Tender sum (or such other sum as is appropriate in accordance with the terms of the tender) for any work for which a tender made under clause 26 (6) of these conditions is accepted and the

value of any work executed by the contractor for which a provisional sum mentioned in the contract Bills or arising under Architect's instruction issued under clause 30 (3) of these, allowing in all cases prorata for the contractor's profit at the rates shown in the contract Bills, shall be added to or deducted from the contract sum. Provided that no deduction shall be made in respect of any damages paid or allowed to the contractor by any sub-contractor or supplier.

6. So soon as is practicable, but before the expiration of the period, the length of which is stated in the appendix to these conditions, from the end of the Defects Liability Period also stated in the said appendix or from completion of making good, defects under clause 40 of these conditions or from receipt by the Architect of the Documents referred to in paragraph (b) of sub-clause (5) of this condition, whichever is the latest, the Architect shall issue the final certificate. The Final certificate shall state :-

a. The sum of the amount paid to the contractor under interim certificate and the amount named in the said appendix as limit of Retention Fund, and,

B. The Contract sum adjusted as necessary in accordance with the terms of these conditions and the difference (if any) between the two sums shall be expressed in the said certificate as a balance due to the contractor from the owner or the owner from the contractor as the case may be, and subject to any deductions authorised by these conditions, the said balance shall as from the fourteenth day after the issue of the said certificate, be a debt payable as the case may be, by the owner to the contractor or by the contractor to the owner.

7. On the completion of the work, the contractor shall be furnished with a certificate by the Architect of such completion, but no such certificate shall be given nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall have been executed, all scaffolding, surplus materials and rubbish, and shall have cleaned off any building in or upon which the work has been executed, or of which he may have had possession for the purpose of executing the work, nor until the work shall have been measured by the Architect or his authorised representative, and the said measurement being binding and conclusive against the contractor. If the contractor shall fail to comply with the requirements of this clause as to the removal of scaffolding, surplus materials and rubbish and cleaning of dirt on or before the date fixed for the completion of the work, the owner may at the expenses of the contractor, remove such materials and rubbish, scaffolding, and dispose of the same with consent of the Architect, as he thinks fit and clean off such dirt as aforesaid and the contractor shall forthwith pay the amount of all expenses so incurred, but shall have no claim in respect of any such scaffolding or surplus materials as aforesaid, except for any sum actually realised by the sale thereof.

8. Unless a written request to CONCUR in the appointment of an Arbitrator shall have been given under clause 55 of these conditions by either party before the Final Certificate has been issued or by the contractor within 28 days after such issue. The said certificate shall be conclusive evidence in any proceedings arising out of this contract (whether by Arbitration under clause 55 of these conditions or otherwise) that the works have been properly carried out and completed in accordance with the terms of this contract and that any necessary effect has been given to all the terms of this contract which require an adjustment to be made to the contract sum, except and in so far as any sum mentioned in the said certificate is erroneous by reason of :-

a. Fraud, dishonesty or fraudulent concealment relating to the works, or any part thereof, or to any matter dealt with in the said certificate; or.

B. Any defect (including any omission) in the works, or any part thereof which with reasonable inspection or examination at any reasonable time during the carrying out of the works or before the issue of the said certificate, would not have disclosed; or

C. Any accidental inclusion or exclusion of any work, materials, goods or figure in any computation or any arithmetical error in any computation.

9. Save as aforesaid, no certificate of the Architect shall of itself be conclusive evidence that any work, materials or goods to which it relates, are in accordance with this contract.

32.0 **CLAIM FOR EXTRA :-** When any instruction or decision given at site involve an extra or whereby the contractor may plan to claim an extra, it shall be the responsibility of the contractor to inform the Architect of the extra amount and get written authorisation from the Architect before proceeding with the work involved.

Any modification carried out for expedite or simplifying the work at the request of the contractor or his representatives, shall not be taken as the basis for claiming an extra, however, if such modification shall also involve an extra, the rate for such modification can be settled in advance and written authorisation obtained by the contractor from the Architect before proceeding with the work involved. It no such information is given by the contractor in writing to the Architect, such modification shall not be accepted as the basis for extra charge.

33. **DEDUCTION FOR UNCORRECTED WORK :-** If the Architect DEEMS it inexpendient to correct work damaged or not done in accordance with the contract, an equitable deduction from the contract price shall be made therefore.

34. **FLUCTUATION :-** The contractor shall not claim any extras for fluctuation of price and the contract price shall not be subjected to any rise or fall of prices.

35. **UNFIXED GOODS AND MATERIALS :-** Unfixed materials and goods intended for, delivered to and placed on or adjacent to the work shall not be removed except for use upon the work, unless the Architect has consented in writing to such removal, which consent shall not be unreasonably withheld. Where the value of any such materials or goods has, in accordance with clause 31(2) of these conditions, been included in any Interim Certificate under the contract for which the contractor has received payment, such materials and goods shall become the property of the owner, but subject to clause 47(b) or to clause 47 (c) of these conditions (if applicable), the contractor shall remain responsible for loss or damage to the same.

36.1 **MATERIALS AND WORKMANSHIP :-** All materials and workmanship shall be as per the relevant code of I.S.I. specification and of approved type and the contractor shall immediately remove from the works any material and/or workmanship, which, in the opinion of the Architect, are defective or unsuitable and shall substitute proper materials and/or workmanship at his own cost. The term approval in connection with this contract shall mean the approval of the Architect.

36.2 The contractor shall, if required, submit satisfactory evidence as to the kind and quality of materials.

36.3 Where special makes or brands are called for, they are mentioned as a standard. Others of equal quality may be used, provided, approval is first obtained in writing from the Architect. Unless substitution are requested, no deviation from the specification will be permitted. Failure to propose the substitution of any article within 30 days after signing of contract, will be deemed sufficient cause for denial of the request of substitution.

36.4 The contractor shall indicate and submit evidence in writing of those materials or articles called for in the specification, that are not obtainable for installation in the work, within the Time Limits of the contract. Failure to indicate the above, within 30 days after the signing of the contract, will be deemed sufficient cause for the denial of request for the extension of the contract time.

36.5 All material shall be delivered so as to insure a speedy and uninterrupted progress of the work. Such material shall be stored so as to cause no obstruction and so as to prevent overloading of any portion of the structure, and the contractor shall be entirely responsible for damage for loss by weather or other cause.

36.6 Within 30 days after signing the contract, the contractor shall submit for approval of the Architect, a complete list of all materials, he and his sub-contractors propose to use in the work of definite brand or make which differ in any respect from those specified; also the particular brand of any article where more than one is specified as a standard. He shall also list items not specifically mentioned in the specification but which are reasonably inferred and necessary for the completion of the work.

36.7 **INSPECTION :-** All materials and workmanship shall be subject to inspection, examination, and test by the Architect at any and all times during manufacture and/or construction. The Architect shall have the right to reject defective material and workmanship or require its correction. Rejected workmanship shall be

satisfactorily replaced with proper material without additional charge therefore and the contractor shall promptly segregate and remove the rejected materials from the works. If the contractor fails to proceed at once with the replacement of rejected materials and/or the correction of defective workmanship, the Architect may as per the contract or otherwise, replace such materials and/or correct such workmanship and charge the cost thereof to the contractor, or may terminate the right of the contractor to proceed further with the work. The contractor shall furnish promptly without additional charge all reasonable facilities, labour and materials necessary for the safe and convenient inspection and test that may be required by the Architect.

37.1 **DEFECTS :-** The contractor shall make good at his own cost and to the satisfaction of the Architect, all defects, shrinkages of small faults, arising, in the opinion of the Architect, from work or materials not being in accordance with the Drawings or specifications or Schedule or Quantities or the Instructions of the Architect, which may appear within "Defects Liability Period" referred to in the appendix.

37.2 Such defects, shrinkages, shall, upon directions in writing of the Architect, and within such reasonable time as shall be specified therein, be amended and made good by the contractor, at his own cost, unless the Architect shall decide that he ought to be paid for such amending and making good, and in case of default, the owner may employ another contractor to amend and make good such defects, shrinkage, settlements or other faults and all damages, loss and expense consequent thereon or incidental thereto, shall be made good and borne by the contractor and such damage, loss or expense shall be recoverable from him by the owner or may be deducted by the owner, upon the Architect's certificate in writing, for any amount due or may become due to the contractor, or the owner may, in lieu of such amending and making good by the contractor pay a sum to be determined by the Architect as equivalent to the cost of amending such work and if the Retention Amount being insufficient, recover the balance form the contractor, together with any expenses the owner may have incurred in connection therewith.

38.1 **POSSESSION, COMPLETION AND POSTPONEMENT :-** On the date for commencement stated in the appendix to these conditions, possession of the site, shall be given to the contractor, who shall thereupon begin the works and regularly and diligently proceed with the same, and who shall complete the same on or before the date for completion stated in the said appendix, subject nevertheless to the provisions for extension of time contained in clause 40 of these conditions.

38.2 The Architect may issue instructions in regard to the postponement of any work to be executed under the provisions of this contract.

39.0 If at any time or times before virtual completion of the work, the owner with the consent of the contractor, shall take possession of any part or parts of the same, for handing over to the finishing contractor or other agency, then, not withstanding anything expressed or implied elsewhere in this contract :-

39.1 Such part or parts shall not be deemed to be virtually complete.

39.2 Virtual completion of such part or parts would occur on the completion of the last part of the structure under this contract.

39.3 The contractor shall not claim that such part or parts are complete and request refund of payment in lieu thereof.

40.0 **EXTENSION :-** Upon it becoming reasonably apparent that the progress of the works is delayed, the contractor shall forthwith, give written notice of the cause of the delay to the Architect, and if in the opinion of the Architect, the completion of the work is likely to be, or has been, delayed beyond the date for completion stated in the appendix to these conditions or beyond an extended period, the previously fixed limit under this clause :-

40.1 By force majeurs.

or

40.2 By reason of any exceptionally inclement weather.

or

40.3 By reason of loss or damage occassioned by any one or more of the contingencies referred to in clause 47(a), (b) and (c) of these conditions.

or

40.4 By reason of civil commotion, local combination of workmen strike or lockout affecting any of the trades employed upon the works or any of the trades engaged in the preparation, manufacture or transportation of any of the goods or materials required for the work.

or

40.5 By reason of Architect's instructions issued under clause 9,30 (1) or 38 (2) of these conditions.

or

40.6 By reason of the contractor not having received in due time necessary instruction, drawings, details of levels from the Architect, for which he specifically applied in writing on a date which having regard to the date of completion stated in the appendix to these conditions or to any extension of time then fixed under this clause, was neither unreasonably distant from nor unreasonably close to the date on which it was necessary for him to receive the same.

or

40.7 By delay on the part of nominated sub-contractors or Nominated suppliers which the contractor has taken all practicable steps to avoid or reduce.

or

40.8 By delay on the part of artists, tradesmen or others engaged by the owner in executing work not forming part of this contract.

or

40.9 By reason of the opening up for inspection of any work covered up or of the testing of any of the work, materials or goods in accordance with clause 36 (7) of these conditions (including making good in consequence of such opening up or testing) unless the inspection of test showed that the work, materials or goods were not in accordance with this contract.

or

40.10 By reason of the contractor's inability for reason beyond his control and which he could not reasonably have foreseen at the date of this contract, to secure such labour, goods or materials as are essential to the proper carrying out of the works.

Then the Architect shall, so soon as he is able to estimate the length of the delay beyond the date of time aforesaid, make in writing a fair and reasonable Extension of Time for completion of the works, provided always that the contractor shall use constantly his best endeavors to prevent delay and shall do all that may reasonably be required to the satisfaction of the Architect to proceed with the work.

41.0 **DAMAGES FOR NON-COMPLETION :-** If the contractor fails to complete the works by the date specified in these conditions or within any extended time fixed under clause 38 of these conditions and the Architect certifies in writing that in his opinion the same ought reasonably so to have been completed, the contractor shall pay or allow to the owner a sum calculated at the rate stated in the appendix as agreed Liquidated Damages for the period during which the said work shall so remain or have remained incomplete, the Owner may deduct such damages from any MONIES otherwise payable to the contractor under this contract.

42.1 **VIRTUAL COMPLETION AND DEFECTS LIABILITY PERIOD :-** When in the opinion of the Architect, the works are practically completed, he shall forthwith issue a certificate to that effect and virtual completion of the work shall be deemed, for all the purposes of this contract, to have been taken place on the say named in such certificate.

42.2 Any defects, Shrinkage or other faults, which shall appear within the "Defects Liability Period" stated in the appendix to these conditions and which are related to materials and workmanship not in accordance with this contract, shall be specified by the Architect in a Schedule of Defects, which he shall deliver to the contractor not later than 14-days after the expiration of the said Defects Liability Period and within reasonable time after receipt of such schedule, the Defects, Shrinkages and other faults therein specified, shall be made good by the contractor and (unless the Architect shall otherwise instruct in which case the contract sum shall be adjusted accordingly) entirely at his own cost.

42.3 Not withstanding sub-clause (2) of this condition, the Architect may, whenever he considers it necessary so to do, issue instructions requiring any defect, shrinkage or other faults which shall appear within the defects liability period named in the appendix to these conditions and which is due to materials and workmanship not in accordance with this Contract, to be made good and the contractor shall within a reasonable time after receipt of such instructions, comply with the same (and unless the Architect shall otherwise instruct in which case the contract sum shall be adjusted accordingly) entirely at his own cost. Provided that no such instruction shall be issued after 14 days from the expiration of the said Defects Liability Period.

42.4 When in the opinion of the Architect, any defects, shrinkages or other defaults which he may have required to be made good under sub-clause (2) and (3) of this condition, shall have been made good, he shall issue a certificate to that effect, and completion of making good defects shall be deemed for all the purposes of this contract to have taken place on the day named in such certificates.

42.5 In no case shall the contractor be required to make good at his own cost any damage which may appear after virtual completion of the work unless the Architect shall certify that such damage is due to injure which took place before virtual completion of the works.

43.1 **LOSS & EXPENSES CAUSED BY DISTURBANCES OR IRREGULAR PROGRESS OF THE WORK :-** If upon written application being made to him by the contractor the Architect is of the opinion that the contractor has been involved in direct loss and/or expense for which he would not be reimbursed by a payment made under any other provision in this contract by reason of the regular progress of the works or of any part thereof having been materially affected by :

A) The contractor not having received in due time necessary instructions, drawings, details or levels from the Architect, for which he specifically applied in writing on a date which having regard to the date for completion stated in the appendix to these conditions, was neither unreasonably distant from nor unreasonably close to the date on which it was necessary for him to receive the same; or.

B) The opening up for inspection of any work covered up for the testing of any work, material or goods in accordance with clause 36(7) of these conditions (including making good in consequence of such opening up or testing), unless the inspection or test showed that the work, materials or goods were not in accordance with this contract; or

C) Any discrepancy or divergence between the contract Drawing and/or the contract Bills; or

D) Delay on the part of the Artists, Tradesmen, or others engaged by the owner in executing work not forming part of this contract; or

E) Architect's instruction issued in regard to the postponement of any work to be executed under the provisions of this contract; and if the written application is made within a reasonable time of it becoming apparent that the progress of the work or of any part thereof has been effected as aforesaid;

Then the Architect shall ascertain the amount of such loss and/or expense.

Any amount from time to time so ascertained shall be added to the amount which would otherwise be stated as due in such certificate.

43.2 The provisions of this condition are without prejudice to any other rights and remedies which the contractor may possess.

44. **PAYMENT WITHHOLD :-** The Architect may WITHHOLD or on account of a subsequently discovered evidence, nullify, the whole or a part of any certificate to such extent as may be necessary in his reasonable opinion to protect the owner from loss on account of :-

A. Defective work not remedied.

B. Failure of the contractor to make payments properly to sub contractor or for materials or labour.

C. A reasonable doubt that the contract can be completed for the balance then unpaid.

D. Damage to another contractor or sub-contractor.

E. Claims filed on reasonable evidence indicating probable filing of claims.

When the above grounds are removed, payment shall be made for amounts withheld because of them.

45.1 **INJURY TO PERSONS OF PROPERTY OWNER :-** The contractor shall be liable for and shall indemnify the owner against any liability, loss, claim or proceedings whatsoever arising under any statute or at common law in respect of works, unless due to any act or neglect of the owner or of any person for whom the owner is responsible.

45.2 Except for such loss or damages as is at the risk of the owner under clause 47(b) or clause conditions (if applicable) the contractor shall be liable for and shall indemnify the owner against any extense, liability, loss, claim or proceedings in respect of any injury or damage whatsoever to any property, real or personal, in so far as such injury or damage arises out of or in the course of by reason of the carrying out of the works and provided always that the same is due to any negligence, omission or default of the contractor, his servants or agents or of any of sub-contractor, his servants or agents.

46.1 **INSURANCE AGAINST INJURY TO PERSONS AND PROPERTY: -**Without prejudice to his liability to indemnify the owner under clause 45 of these conditions, the contractor shall maintain and shall cause any sub-contractor to maintain;

Such insurance as are necessary to cover the liability of the contractor, or as the case may be, of such sub-contractor, in respect of personal injuries or deaths arising out of or in the course of or caused by the carrying out of the work: and

Such insurance as may be specifically required by the contract Bills in respect of injury or damage to property, real or personal, arising out of or in the course of or by reason of the carrying out of the work, and caused by any negligence, omission or default of the contractor, his servants or agents or, as the case may be, of such sub-contractor, his servants or agents.

The contractor shall produce or cause any sub-contractor to produce for inspection, the relevant policy or policies of insurance together with the receipts in respect of premiums paid under such policy or policies as and when required, by the Architect, provided always that as and when may be reasonably required by the Architect, the production by either the contractor or any sub-contractor of a current certificate of insurance from the COMPANY or firm which shall have issued the policy or policies aforesaid, shall be a good discharge of the contractor's obligation to produce or to cause the production of the policy or policies and the receipts in respect of premiums paid.

46.2A The contractor shall maintain in the joint names of the owner and contractor, such insurances as may be required in respect of any expense, liability, loss claim or proceedings which the owner may INCURR or sustain by reason of injury or damage to property, real or personal, arising out of or in the course of or by reason of the carrying out of the work, and caused otherwise than by the negligence, omission or default of the contractor, his servants or agents, or any sub-contractor, his servants or agents.

B. Any such insurance as is referred to in immediately preceding paragraph shall be placed with insurers to be approved by the Architect and the contractor shall have to deposit with him the policy or policies and the receipts in respect of premiums paid.

3. Should the contractor or any sub-contractor make default in insuring or in continuing to insure as provided in sub-clauses (1) and (2) of this condition, the owner may himself insure against any risk, with respect to which the default shall have occurred and may deduct a sum equivalent to the amount paid in respect of premiums from any monies due to or become due to the contractor.

47.A1 **INSURANCE OF THE WORKS AGAINST FIRE ETC. :-** The contractor shall in the joint names of the owner and contractor, insure against loss or damage by fire, storm, tempest, lightening, flood, earthquake, aircraft or anything dropped there-from, aerial objects, riot and civil commotion, for the full value thereof, all work executed and all unfixed materials and goods intended for delivery to or placed on or adjacent to the work, but excluding temporary building, plant, tools and equipment owned or hired by the contractor or any sub-contractor and shall keep such work, materials, and goods so insured until virtual completion of the work. Such insurances shall be with insurers approved by the Architect and the contractor shall deposit with the Architect the policy or policies and the receipts in respect of premium paid and should the contractor make default in insuring or continuing to insure as aforesaid, the owner may himself insure against any risk with respect of which the default shall have occurred and deduct a sum equivalent to the amount paid by him in respect of premium, from any monies due to or to become due to the contractor.

Provided always that if the contractor shall independently of his obligation under this contract, maintain a policy of insurance which covers (inter alia) the said work, materials and goods against the aforesaid contingencies to the full value thereof, then the maintenance by the contractor of such policy, shall, if the owner's interest is endorsed thereon, be a discharge of the contractor's obligation to insure in the joint names of the owner and contractor and the production by the contractor as and when may reasonably be required by the Architect of a current certificate of insurance from the company or firm which shall have issued the said policy shall be a discharge of the contractors obligation to deposit with the Architect a policy or policies and the receipts in respect of premium paid.

2. Upon settlement of any claim under the insurances aforesaid, the contractor with due diligence, shall restore work damaged, replace or repair unfixed materials or goods which have been destroyed or injured, remove or dispose of any debris and proceed with the carrying out and completion of the work. All MONIES received from such insurance shall be paid to the contractor by installments under certificates of the Architect issued at the period of interim certificates named in the appendix to these conditions. The contractor shall not be entitled to payment in respect of the restoration of work damaged, the replacement and repair of any unfixed materials or goods and the removal and disposal of debris other than the monies received under the said insurances.

All work executed and all unfixed materials and goods intended for, delivered to and placed on or adjacent to the works (except temporary building, plant, tools and equipment owned or hired by the contractor or any sub-contractor) shall be at the sole risk of the owner as regards loss or damage by fire, storm, tempest, lightning, flood, earthquake, aircraft or anything dropped thereof or any such unfixed materials or goods is occasioned by any one or more of the said contingencies, then :-

A. The occurrence of such loss or damage shall be disregarded in computing any amounts payable to the contractor under or by virtue of this contract.

B. The contractor with due diligence shall restore work damaged, replace not repair, any unfixed materials or goods which have been destroyed or injured, and dispose of any debris and proceed with carrying out and completion of the work. The restoration of work damaged, the replacement and repair of unfixed materials and goods and the removal and disposal of debris shall be deemed to be a variation required by the Architect.

C. The existing structure together with all the contents thereof and the works and all unfixed materials and goods intended for, delivered to and placed on or adjacent to the works (except temporary building, plant, tools and equipment owned or hired by the contractor or any sub-contractor) shall be at the sole risk of the owner as regards loss or damage by fire, storm, tempest, lightning, flood earthquake, aircraft or anything dropped there-from aerial objects, riot and civil commotion, and the owner shall maintain adequate insurance against that risk if any part thereof or any such unfixed materials or goods as occasioned by any one or more of the said contingencies, then :

(i) The occurrance of such loss or damage shall be disregarded in computation of any amount payable to the contractor under or by virtue of the contract.

(II) (i) If it is just and equitable, so to do the employment of the contractor under this contract, may within 28 days of the occurrence of such loss or damage, be determined at the opinion of either party by notice by registered post or recorded delivery from either party to the other, within seven days of receiving such notice (but not thereafter) either party may give to the other a written request to concur in the appointment of an Arbitrator under clause 53 of these conditions in order that it may be determined whether such determination will be just and equitable.

(ii) Upon the giving or receiving by the owner of such a notice of determination or, where a reference to Arbitration is as aforesaid upon the Arbitrator upholding the notice of determination, the provisions of sub-clause (2) (except sub-paragraph (iii) or paragraph (B) of clause 49 of these conditions) shall apply.

(iii) It no notice of determination as served as aforesaid or where a reference to Arbitration is made as aforesaid, if the Arbitrator decides against the notice of determination, then.

i. The contractor with the diligence shall reinstate or make good such loss or damages and proceed with the carrying out and completion of the works.

ii. The Architect may issue instruction requiring contractor to remove and dispose of any debris and,

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Clause 47(A)* is applicable to the erection of new building if the contractor is required to insure against loss or damage by fire, etc. clause 47(b)* is applicable to the erection or a new building if the owner is to bear the risk in respect of loss or damage by fire etc. And clause 47 (c)* is applicable to alterations of or extension of an existing building: therefore strike out clause (b) and (c) or clause (a) and (c) or clause (b) and (a) as the case may be.

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iii. The reinstatement and making good of such loss or damage and (when required) the removal and disposal of debris shall be deemed to be a variation required by the Architect.

48.1 **DETERMINATION BY OWNER :-** DEFAULTS : It the contractor shall make default in any one or more of the following respects, that is to say :

A. It he without reasonable cause, wholly suspends the carrying out of the works before completion thereof, or

B. If he fails to proceed regularly and diligently with works, or

C. If He refuses or persistently neglects to comply with a written notice from the Architect requiring him to remove defective work or improper materials or goods and by such refusal so neglect the work that it is materially affected, or,

D. If he fails to comply with the provision of clause 25, then the Architect may give him the notice by registered post or recorded delivery specifying the default and if the contractor either shall continue such a default for 14-days after receipt of such a notice and shall at any time thereafter repeat such a default (whether previously repaired or not), then the owner without prejudice to any other rights or remedies, may, within 10-days after such continuance or repetition of notice by registered post or recorded delivery, forthwith determine the employment of the contractor under this contract, provided that such notice shall not be given unreasonably or vexatious.

48.2 BANKRUPTCY OF CONTRACTOR : In the even of the contractor becoming bankrupt or making a composition or arrangement with his creditors or being a company having a winding up order made or (except for purpose of reconstruction) a resolution for voluntary winding up passed on a receiver or manager of his business or undertaking, duly appointed or possession taken, By or on behalf of the holder of any debentures secured by a floating charge, of any property comprised in or subject to the floating charge, the employment of the contractor under this contract shall be forthwith automatically be determined, but the said employment may be reinstated, and continued if the owner and the contractor, his trustee in bankruptcy, liquidator, receiver or Manager, as the case may be, shall so agree.

48.3 The owner shall be entitled to determine the employment of the contractor under this contract, If the contractor shall have offered or given or agreed to give to any person any gift or consideration of any kind as an inducement or reward for doing or for bearing to do or for having done or forborne to do any action in relation to this contract or any other contract with the owner, or if the like acts shall have been done by any person employed by the contractor or acting on his behalf (whether with or without the knowledge of the contractor) or if in relation to this contract or any other contract with the owner, the contractor or any person employed by him or acting on his behalf. Shall have committed any offence under the prevention of corruption act, or shall have given any free gift or reward the receipt of which is an offence under the Local Government Act.

48.4 In the event of the employment of the contractor being determined as aforesaid and so long as it has been reinstated and continued, the following shall be the respective rights and duties of the owner and contractor.

A. The owner may employ and pay other persons to carry out and complete the works and he or they may enter upon the works and use all temporary buildings, plant, machinery, appliances, goods and materials intended for, delivered to and placed on or adjacent to the works and may purchase all materials and goods necessary for the carrying out and completion of the works.

B. The contractor shall, if so required by the owner or Architect, within 14 days of the date of determination, assign to the owner, without payment, the benefit of any agreement for the supply of materials or goods and/or for the execution of any works for the purposes of this contract but on the terms that a supplier or sub-contractor shall be entitled to make any reasonable objection to any further assignment thereof any by the owner. In any case the owner may pay any supplier or sub-contractor for any materials or goods delivered or works executed for the purpose of the contract (whether before or after the date of determination), in so far as the price thereof has not already been paid by the contractor. The owner's rights under this paragraph are in addition to his rights to pay nominated sub-contractor as provided in clause 26 (2) and payment made under this paragraph may be deducted from any sum due or to become due to the contractor.

C. The contractor shall as and when required in writing by the Architect, so to do (but not before) remove from the works any temporary buildings, plant, tool equipments, goods and materials belonging to or hired by him. If within a reasonable time after any such requirements has been made, the contractor, has not complied therewith, then the owner may (but without being responsible for any loss or damage) remove and sell any such property of the contractor, holding the proceeds less all costs incurred the credit of the contractor.

D. The contractor shall allow or pay to the owner in the manner hereinafter appearing the amount of any credit loss and/or damage caused to the owner by the determination. Until after completion of the works under paragraph (A) of this sub-clause, the owner shall not be bound by any provisions of this contract to make any further payment to the contractor, but upon such completion and the verification within a reasonable time of the accounts therefore, the Architect shall certify the amount of expense properly incurred by the owner and the amount of any direct loss and/or damage caused to the owner by the determination and if such amounts when added to the monies paid to the contractor before the date of determination, exceed the total amount which would have been payable on the completion in accordance with this contract, the difference shall be a debt payable to the owner by the contractor : and if the said amounts, when added to the said monies be less, then the difference shall be a debt payable by the owner to the contractor.

E. **ACTION WHEN WHOLE OF SECURITY DEPOSIT IS FORFEITED :-** In any case in which under any clause of this contract the contractor shall have rendered himself liable to pay compensation amounting to the whole of his security deposit (whether paid in one sum or deducted by installments) or in the case of abandonment of the work owing to serious illness or death of the contactor or any other cause, the Architect, on behalf of the owner shall have power to adopt any of the following courses, as he may deem best suited to the interest of owner.

(a) To rescind the contract (for which rescission notice in writing to the contractor under the hand of Architect shall be conclusive evidence) and in that case the security deposit of the contractor shall stand forfeited and be absolutely at the disposal of owner.

(b) To carry out the work or any part of the work departmentally, debiting the contractor with the cost of the work, expenditure incurred on tools and plant and charges on additional supervisory staff including the cost of work charged establishment employed for getting unexecuted part of the work completed and crediting him with the value of the work done departmentally in all respects in the same manner and at the same rates as if it had been carried out by the contractor under the terms of this contract. The certificate of the Architect as to the costs and

other allied expenses so incurred and as to the value of the work so done departmentally shall be final and conclusive against the contractor.

(c) To order that the work of the contractor be measured up and to take such part thereof as shall be unexecuted, out of his hands and to give it to another contractor to complete, in which case all expenses incurred on advertisement for fixing a new contracting agency, additional supervisory staff including the cost of the work executed by the new contract agency, will be debited to the contractor and at the value of the work done or executed through the new contractor shall be credited to the contractor in all respects and in the same manner and at the same rates as if it had been carried out by the contractor under the terms of his contract. The certificate of the Architect as to all the cost of the work and other expenses incurred as aforesaid for or in getting the unexecuted work done by the new contractor and as to the value of the work so done, shall be final and conclusive against the contractor.

(d) In case the contract shall be rescinded under clause (a) above, the contractor shall not be entitled to recover or be paid any sum for any work therefore actually performed by him under this contract unless and until the Architect shall have certified in writing the performance of such work and the amount payable to him in respect thereof and he shall only be entitled to be paid the amount so certified. In the event of either of the courses referred to in clause (b) or (c) being adopted and the cost of the work executed departmentally or through a new contractor and other allied expenses exceeding the value of such work credited to the contractors, the amount of excess shall be deducted from any money due to the contractor by owner under the contract or otherwise, howsoever, or from his security deposit or the sale proceeds thereof provided, however that the contractor shall have no claim against owner even if the certified value of the work done departmentally or through a new contractor exceeds the certified cost of such work and allied expenses, provided always that whichever of the three courses mentioned in clauses (a), (b) or (c) is adopted by the Architect, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased, or procured any materials, or entered into any engagements, or made any advances on account of, or with a view of the execution of the work or the performance of the contract.

(e) **ACTION WHEN THE PROGRESS OF ANY PARTICULAR PORTION OF THE WORK IS UNSATISFACTORY :-** If the progress of any particular portion of the work is unsatisfactory, the Architect shall, not-withstanding that the general progress of the work is in accordance with the conditions mentioned above, be entitled to take action under clause 48-4E after giving the contractor 10 days notice in writing. The contractor will have no claim for compensation, for any loss sustained by him owing to such action.

(f) **CONTRACTOR REMAINS LIABLE TO PAY COMPENSATION IF ACTION NOT TAKEN UNDER CL. 48-4E :-** In any case in which any of the powers conferred upon the Architect by clauses as above hereof shall have been exercisable and the same shall not have been exercised, the non-exercise thereof shall not constitute a waiving of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the contractor for which under any clauses hereof he is declared liable to pay compensation amounting to the whole of his security deposit and the liability of the contractor for past and future compensation shall remain unaffected.

(g) **POWER TO TAKE POSSESSION OF OR REQUIRE REMOVAL OF OR SELL CONTRACTOR'S PLANT :-** In the event of the Architect taking action under sub-clause as above, he may, if he so desires, take possession of all or any tools, plant, materials and stores, in or upon the works or the site thereof or belonging to the contractor, or procured by him and intended to be used for the execution of the work or any part thereof, paving or allowing for the same in account at the contract rates, or in the case of contract rates not being applicable, at current market rates, to be certified by the Architect whose certificate thereof shall be final. In the alternative, the Architect may, after giving notice in writing to the contractor or his clerk of the works, foreman or other authorised agent, require him to remove such tools, plant, materials, or stores from the premises within a time to be specified in such notice; and in the event of the contractor failing to comply with any such requisition, the Architect may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and at his risk in all respects, and the certificate of the Architect as to the expense of any such sale, shall be final and conclusive against the contractor.

49.1 Without prejudice to any other rights and remedies which the contractor may possess, if :

A) The owner does not pay to the contractor the amount due on any certificate within the period for Honoring Certificates named in the appendix to these conditions and continues such default for seven days after receipt

by registered post or record delivery of a notice from the contractor stating that notice of determination under this condition will be served if payment is not made within seven days from receipt thereof : or

B) The owner interferes with or obstructs the issue of any certificate due under this contract :- or

C) The carrying out of the whole or substantially the whole of the uncompleted works (other than the execution of work required under clause 42 of these conditions) is suspended for a continuous period of the length by reason of;

i) Force majeure, or

ii) Loss or damage occasioned by any or more of the contingencies referred to in clause 47 (a) or clause 47 (b) of these conditions (if applicable), or

iii) Civil Commotion, or

iv) Architect's instructions issued under clause 5(3), 30 (1) or 38 (2) of these conditions, or

v) The contractor not having received in due time necessary instructions, drawings, details or levels from the Architect for which he specifically applied in writing on a date, which, having regard to the date of completion stated in the appendix to these conditions or to any extension of time then fixed under clause 40 of these conditions was neither unreasonably distant from nor unreasonably close to the date on which it was necessary for him to receive the same. or

vi) Delay on the part of Artists, Tradesmen or others engaged by the owner in executing work not forming part of this contract, or

vii) The opening up for inspection of any work covered up or of the testing of any of the work materials or good, in accordance with clause 36(7) of these conditions (including making good in consequence of such opening up or testing) unless the inspection or test showed that the work materials or goods were not in accordance with this contract.

The contractor may thereupon by notice by registered post or recorded delivery to the owner or Architect, forthwith determine the employment of the contractor under this contract, provided that such notice shall not be given unreasonably or vexatious.

49.2 Upon such determination, then without prejudice to the accrued rights or remedies of either party or to any liability of the clauses mentioned in clause 43 of these conditions which may accrue whether before the contractor or any sub-contractors shall have removed his or their temporary buildings, plant, machinery, appliances, goods or materials or by reason of his or their so removing the same, the respective rights and liabilities of the contractor and the owner shall be as follows, that is to say :

A) The contractor shall with all reasonable diligence dispatch and in such manner and with such precautions as will prevent injury, death or damage in respect for which before the date of determination he was liable to indemnify the owner under clause 42 of these conditions, remove from site all his temporary buildings, plant, machinery, appliances, goods and materials and shall give facilities for his sub-contractors to do the same but subject always to the provisions of sub-paragraph (iii) of paragraph (B) of this sub-clause.

B) After taking into account amounts previously paid under this contract, the contractor shall be paid by the owner :

i) The total value of the works completed at the date of determination.

ii) The total value of work begun and executed but not completed at the date of determination, the value being ascertained mutatis mutandis in accordance with clause 30(1) of these conditions.

iii) The cost of materials or goods properly ordered for the works for which the contractor shall have paid or of which the contractor is legally bound and on such payment by the owner, materials or goods so paid for, shall become the property of the owner.

iv) The reasonable cost of the removal under paragraph (a) of this sub-clause.

v) Any direct loss and/or damage caused to the contractor by the determination. Provided that in addition to all other remedies, the contractor upon such determination, may take possession of and shall have a lieu upon all unfixed materials which may have become the property of the owner, under clause 32, until payment of all monies due to the contractor from the owner.

50. **CO-ORDINATION OF WORK :-** At the commencement of work, and from time to time, the contractor shall confer with the sub-contractor, persons engaged on separate contracts in connection with the work, and with the Architect for the purpose of the co-ordination and execution of the various phases of the work.

The contractor shall ascertain the sub-contractor, persons engaged on separate contracts in connection with the works, the extent of all chasings, cuttings, and forming of all openings, holes, grooves, etc. as may be required to accommodate the various services, the contractor shall ascertain the routes of all services and the positions of all floor outlets, traps, etc. in connection with the installation of plant and services and arrange for the construction of work accordingly. The breaking and cutting of complete work must be avoided.

51. **CHILD & FEMALE LABOUR :-** The contractor shall employ no child labour under 14 years of age on the work. If female labour is engaged, the contractor shall make necessary provision for safeguarding small children and keeping them clear of the site of operations. No labour shall reside within the compound except authorised guards.

52. **PROTECTION OF TREES AND SHRUBS :-** Trees and Shrubs designated by the Architect shall be protected from damage during the course of the work and the earth level shall not be changed within three feet of such trees. Where necessary, such trees and shrubs shall be protected by means of temporary fencing.

53.1 **GUARANTEES :-** Besides guarantees required elsewhere, the contractor shall guarantee the work in general for one year as noted under clause of the conditions.

53.2 All required guarantees shall be submitted to the Architect by the contractor when requesting certification of accounts for payment by the owner.

54.1 All fossils, antiques and other objects of interest of value which may be found on the site or in excavating the same during the progress of the work, shall become the property of the owner. The contractor shall carefully take out and preserve all such objects and shall immediately or as soon as conveniently may be after the discovery of such articles, deliver the same into the possession of the Architect or of the clerk-of-works un-cleaned and as excavated.

54.2 If in the opinion of the Architect compliance with the provisions of the preceding sub-clause has involved the contractor in direct loss and/or expense for which he would not be reimbursed by a payment made under any other provision in this contract, then the Architect shall ascertain the amount of such loss and/or expenses. Any amount from time to time so ascertained shall be added to the contract sum, and if an Interim certificate is issued after the date of ascertainment, any such amount shall be added to the amount which would otherwise be stated as due in such certificate.

55. The decision, opinion, direction, certificate (except for payment) with respect to all or any of the matters under clause 5, 9, 19, 25, 26, 36, 40 (1, 2, 4, 7 and 8) and 48 hereof (which matters are herein referred to as the excepted matters) shall be final and conclusive and binding on the parties hereto and shall be without appeal. Any other decision, opinion, direction, certificate or valuation of the Architect or any refusal of the Architect to give any of the same, shall be subject to any right of Arbitration and review in the same way in all respect (including the provision as to opening the reference), as if it were a decision of the Architect under the following clause.

56. **ARBITRATION :-** All dispute and differences of any kind whatsoever arising out of or in connection with the contractor carrying out of the works (whether during the progress of the work or after their completion and whether before or after the determination, abandonment or breach of the contract) shall be referred to and settled by the Architect who shall state his decision in writing. Such decision may be in the form of a Final

certificate or otherwise. The decision of the Architect with respect of any of the excepted matters shall be final and without appeal. But if either the owner or the contractor be dis-satisfied with the decision of the Architect on any matter, question or dispute of any kind (except any of the excepted matters) or as to the withholding by the Architect of any certificate to which the contractor may claim to be entitled, then and in any such case, either party (the owner or the contractor) may within 28 days after receiving notice of such decision, give a written notice to the other party through the Architect, requiring that such matters in dispute be Arbitrated upon. Such written notice shall specify the matters which are in dispute and such dispute or difference of which such written notice has been given and no other, shall be and is hereby referred to the Arbitration and Final decision of a single Arbitrator being a Fellow of the Indian/Equivalent Institute of Engineer/ Architect to be agreed upon and appointed by both the parties or in case of disagreement to the appointment of a single Arbitrator, to the Arbitration of two Arbitrators both being Fellow of the Indian/Equivalent Institute of Engineers/Architects, one to be appointed by each party, which Arbitrator shall before taking upon themselves the burden of reference, appoint an Umpire.

The Arbitrator, the Arbitrators or the Umpire shall have power to open up, review and revise any certificate, opinion, decision, requisition or notice, save in regard to the excepted matters referred to in clause, and to determine all matters in dispute which shall be submitted to him or them and of which notice shall have been given as aforesaid.

Upon every or any such reference, the cost of and incidental to the reference and Award respective, shall be in the discretion of the Arbitrator or Arbitrators or the Umpire who may determine the amount thereof or direct the same to be taxed as between Attorneys and client or as between party and shall direct by whom and to whom and in what manner the same and party and shall be borne and paid. This submission shall be deemed to be a submission to Arbitration within the Indian/Equivalent Arbitration Act, 1899/1949 or any statutory modification thereof. The Award of the Arbitrator or Arbitrators or the Umpire shall be final and binding on the parties. Such reference, except as to the withholding by the Architect of any certificates under clause 49, to which the contractor claims to be entitled, shall not be opened or entered upon until after the completion or alleged completion of the works or until after the practical cessation of the works arising from any cause unless with the written consent of the owner and the contractor. Provided always that the owner shall not withhold the payment of an Interim certificate, nor the contractor, except with the consent in writing of the Architect, in any way delay the carrying out of the works by reason of any such matters, questions or dispute being referred to Arbitration but shall proceed with the work with all due diligence and shall, until, Umpire to be given, abide by the decision of the Architect and no Award of the Arbitrator or Arbitrators or the Umpire shall relieve the contractor of his obligations to adhere strictly to the Architects instructions with regard to the actual carrying out of the works. The owner and contractor hereby also agree that the Arbitration under this clause shall be a condition precedent to any right of action under the contract.

Place of arbitration will be **MULA SSK LTD.,** P.O :- Sonai, Tal :- Newasa, Dist :- Ahmednagar 414 105, and language will be English.

57.1 **PROTECTION AND CLEANING :-** The contractor shall protect and preserve the work from all damage or accident providing any temporary road, window and door coverings, boxing or other construction as required by the Architect. This protection shall be provided for all property adjacent to the site as well as on the site.

57.2 The contractor shall properly clean the work as it progresses and shall remove all rubbish and debris from the site from time to time as is necessary and as directed. on completion, the contractor shall ensure that the premises and/or site are cleaned of surplus materials debris, sheds etc. removed, areas under floors cleared of rubbish, gutters and drains cleared, doors and sashes eased, locks and fastenings oiled, keys clearly labeled and handed to the clerk of works, so that the whole is left fit for immediate occupation or use and to the satisfaction of the Architect.

58. The contractor shall exercise every care to ensure that all structural members are sufficiently plumb and true to dimensions called for on the drawings to receive prefabricated finishing elements such as doors, windows, cabinet work, ceramic work, concrete, tile etc. Any variations which may require rectification in the structural members or may involve remarking or replacing the finishing elements, fabricated to fit into the openings or spaces, as called for on the drawing, to be done by the Contractor.

In case of separate contract, the contractor whose work does not conform to dimensions called for, shall be liable for all the expenses which may have to be incurred for rectification or replacement as may be required by the Architect for the proper installation of the finishing elements. The Architect's decision in this respect shall be final and binding on the parties concerned.

59. The contract shall be governed by and interpreted in accordance with the Indian/Equivalent laws. No suit or any proceedings in regard to any matter arising in any respect under this contract shall be instituted in any court other than the court at Sonai / Newasa, Dist :- Ahmednagar, Maharashtra. No other court shall have jurisdiction to entertain any suit or proceedings even though part of the cause of action might arise within their jurisdiction.

3.5.APPENDIX HEREINBEFORE REFERRED TO.

37.1)	DEFECTS LIABILITY PERIOD :	12 Months
31.5)	PERIOD OF FINAL MEASUREMENT :-	2 Months, maximum from the date AND VALUATION of work completed.
38.1)	DATE OF COMMENCEMENT :	As mentioned in Tender Notice, against each work.
41)	AGREED LIQUIDATED DAMAGES :	1% (one percent) of the contract amount per week or part of week maximum upto 10% (ten percent) of the contract cost.
31.1)	VALUE OF WORK FOR INTERIM CERTIFICATE :-	NOT LESS THAN RS. 25,00,000/-
31.3)	RETENTION PERCENTAGE :-	Four per cent of the contract cost.
31.6)	INSTALMENT AFTER VIRTUAL COMPLETION :-	50% of the Retention amount shall be released.
31.1)	PERIOD OF HONOURING CERTIFICATE :-	15 Days from the date of Architect's certificate.
	RATE OF INTEREST FOR DELAYED :- PAYMENT	As per prevailing R.B.I. / Nationalised Bank Rates

NOTE : SECURITY DEPOSIT OF 10% (TEN PERCENT) OF THE TOTAL SECURITY DEPOSIT (i.e. 10% OF 4% security deposit) WOULD BE KEPT WITH THE CLIENT TILL THE DEFECTS LIABILITY PERIOD. THE SECURITY DEPOSIT OF 4% SHOULD BE PAYABLE AS UNDER :

1) 2% Security Deposit would be acceptable in the form of Bank Guarantee to be submitted to the Client at the time of issuing the work order for the various works.

2) Remaining 2% of the Security Deposit would be deducted from the R.A. Bills of the Contractor, from time to time.

The amount of the security deposit as deducted from the various bills, will be refunded to the contractor, after certifying the final bills of the various works (except for the 10% as above.)

ALSO REFER SPECIAL CONDITIONS OF CONTRACT FOR PERFORMANCE SECURITY DEPOSIT (ADDITIONAL SECURITY DEPOSIT DETAILS).

3.6 - GENERAL CONDITIONS (A)

1. **APPLICATION OF SPECIFICATION :-**

This specification forms part of the contract and shall be read in conjunction with the other Documents forming the contract, viz, The Articles of Agreement, Conditions of Contract Tender Form, Schedule of Quantities and Drawings. The contractor shall accept and abide by each and every of the documents without exception, subject to conditions of contract.

2. **DEFINITION** :-

a) The term 'At own cost' shall mean that the contractor shall at his own cost furnish labour and material to complete the item of works to which the term is applied. Rates of various items in the Schedule of Quantities shall be inclusive of such items.

b) "As indicated" shall mean as indicated in any of the Contract Documents.

c) "As Directed" shall mean as directed by the Employer / Owner / Client.

d) "The Owner / Employer" shall mean **MULA SSK LTD.,** P.O :- Sonai, Tal :- Newasa, Dist :- Ahmednagar 414 105, or their authorised representatives.

e) "Architects" shall mean M/s. SHIVAJI D. PATIL, FIE B.S. (CIVIL) M.S. (U.S.A.), MR. NINAD SHIVAJIRAOPATIL, ARCHITECT, MR. YUGANDHAR NINAD PATIL, M.E, or their authorised representatives.

f) "Bills (or schedule) of Quantities" shall mean the list of items giving the quantities and description of work comprised in this contract. The rates in the Bills of Quantities shall apply in assessing the value of the work as carried out.

g) "Day work" shall mean the method of valuing work on the basis of the time spent by the workmen, the materials used and the plant employed.

h) "Prime cost (or the initials "P.C.") shall mean the net sum entered in the Bills of Quantities by the Quantity Surveyors provided to cover the cost of, or others for specific articles of materials to be supplied or work to be done.

i) "Provisional Sum" shall mean any sum of money fixed by the Employer and included in the Bills of Quantities, to provide for work not otherwise included therein or for unforeseen contingencies arising out of the contract. It is intended to expend either wholly or in part, under the Employer's direction and at his discretion in accordance with the conditions of contract.

j) "Schedule of Basic Prices" mean the schedule in which the contractor can insert the basic prices of materials upon which his tender has been computed.

3. **PRELIMINARIES** :-

a) The documents comprising the contract shall be :-

1.	Articles of Agreement.	2.	Conditions of contract
3.	Form of Tender	4.	Schedule of Quantities
5.	Specifications	6.	Scale Drawings

4. **CONTRACT** :
The form of the "Conditions of Contract" referred to in para 3 of this section will be the standard form as enclosed.

5. **CONTRACTOR TO INCLUDE IN HIS RATES** :

Rates of all items appearing in Schedule of Quantities, shall include for all items listed in this section, except those for which the contractor has been specifically asked to Provide provisional Sum.

6. **SITE**

The site of the works will be **MULA SSK LTD.,** P.O :- Sonai, Tal :- Newasa, Dist :- Ahmednagar 414 105

7. **GROUND CONDITIONS** :

a) Visit the site and ascertain local conditions.

b) Allow for all extras likely to be incurred due to any official limitations whatsoever.

8. **ANNOYANCE TO NEIGHBOUR** :

Do everything possible so as to cause least inconvenience to the occupants of the neighboring properties, if any. For this purpose allow for following directions or executing any works which in the opinion of the Employer, are, at any time, considered necessary.

9. **TIME FOR COMPLETION** :

a) Time will be the essence of the contract. Complete the whole of the works within the time stated in the tender subject to the conditions of contract.

10. **TIME AND PROGRESS CHART** :

a) Co-operate with the Employer from time to time in the preparation of time and progress chart for the use, and completion of the whole work within the stipulated time limit.

11. **ASCERTAINED AND LIQUIDATED DAMAGES** :

The sum indicated in the Appendix to the conditions of contract as ascertained and liquidated damage for each week or part of a week that the works remain incomplete after the expiry of the extended contract date for completion.

12. **TREASURE TROVE ETC** :

Hand over to the Employer any treasure trove, coins or object of antiquity which may be found on the site.

13. **SUBLETTING** :

Do not sublet to other persons any part of the works without the consent, in writing, of the Employer.

14. **PROTECTIVE CLOTHING** :

Provide all necessary protective clothing for the operatives. Keep at site a standard First Aid Box.

15. **TEMPORARY ROADS** :

Provide and maintain all necessary temporary roads to the satisfaction of the Employer.

16. **STORE ON THE SITE** :

a) Provide for all necessary storage on the site in specified areas for all materials such as timber, cement, lime and such other material which are likely to deteriorate by the action of sun, wind, rain or other natural causes. Clear away all such stores and leave works in good order on completion of this contract, unless otherwise expressly mentioned herein.

b) Stock materials such as bricks, gravel, sand etc. in such a manner so as to facilitate rapid and easy checking of their quantities.

17. **DRINKING WATER FACILITIES** :

Provide at suitable places, covered drinking water accommodation for workers. Drinking water shall be provided in earthenware pots or glass jars purchased from the company. Distribution of glass, jars to workers all over the works, will not be permitted, storage of which shall be restricted to confined spaces only.

18. **LAVATORIES** :

Provide adequate closet and sanitary accommodation for all workmen on site in addition to similar facilities already existing on site. These shall be in accordance with the rules and regulations in force of the local and public authority or authorities. Maintain same in good working order and properly disinfected.

19. **DUMPLY LEVEL , THEODOLITE, TOTAL STATION EQUIPMENT** :

Maintain at all times a good Dumpy level, Theodolite, Total Station, at site in perfect working condition to enable the Employer / Architect to check the lines and levels of work.

20. **SAMPLES** :

Submit samples at own cost of all materials proposed to be used for approval of and as directed by the Employer. Samples will not be returned to the contractor. The same shall be kept and properly protected in the site office for reference and guidance.

21. **TESTING OF WORKS AND MATERIALS** :-

Arrange to test materials and/or portions of the works at own cost, if required by the Employer, in order to prove their soundness and efficiency. If in the opinion of the Employer, after any such test, the work or portion of the works is found to be defective or unsound, it shall be pulled down and re-executed at the cost of the contractor. The contractor shall remove the defective materials from site forthwith.

22. **MECHANICAL PLANT** :

Besides the provision made in conditions of contract, provide and maintain in working order the power-driven equipments during the construction of the work, as indicated.

23. **DIMENSIONS** :

Figure Dimensions are to be taken in preference to scaled. Large scale details supersede small scale, and all dimensions shall be checked by the contractor and discrepancies, if any, shall be referred to Employer/Architects, prior execution of the work.

24. **KEEPING FOUNDATIONS AND WORKS FREE FROM WATER :**

Provide and maintain at own cost electrically or other power driven pumps and/or other plant for keeping foundations and works free from water. Continue to do so until the building are handed over to the owner/employer. Arrange for disposal of the water so accumulated, all to the satisfaction of the employer and the local authorities. Log Book shall be maintained at site.

25. **FOREMAN AND TRADESMEN :**

a) All tradesmen shall be experienced men properly equipped with suitable tools for carrying out works of their respective trades in a first class manner. Provide any such tools, special or ordinary, which, in the opinion of the Employer, are considered necessary to the carrying out of such works.

b) Tradesmen shall work under experienced and properly trained foremen. The Foremen shall be capable of reading and understanding drawings. Also see clause 10 of conditions of contract.

26. **PREPARATION OF BUILDING WORKS FOR OCCUPATION AND USE ON COMPLETION :-**

a) Thoroughly inspect the whole of the works and put right all deficiencies and defects. After inspection, inform the employer in writing, that the work is ready for his inspection.

b) Clean all windows, doors, all hardware, inside and outside and all floors, roofs, staircases and each and every other part and item of the building. Leave the entire building neat and clean and ready for immediate occupation and to the satisfaction of the Employer.

27. **WEEKLY PROGRESS REPORT :**

Furnish to the Employer particulars for all compiling weekly progress reports on the forms provided by him.

28. **SCHEDULE OF QUANTITIES :-**

a) The quantities will form part of the contract, but the owner/Employer does not undertake to carry out the whole of the work as shown on the plans and/or appearing in Schedule of Quantities and reserves the right to modify the same or any part thereof.

b) The Specifications and Schedule of Quantities are to be read together and the contractor is referred to the Schedule of Quantities for more detailed description of materials and workmanship.

29. **CONTRACTOR TO PROVIDE ETC. :**

a) Provide two notice boards on proper supports each 10' x 6' high in position approved by the Employer. Allow for painting and lettering, stating name of work; name of the work shall be in letters not exceeding 2" in height and all to the approval of the Employer / Architect's.

30. **PROTECTION WATCHING AND LIGHTING :**

a) Properly cover up and protect all works throughout the duration of works until completion, particularly masonry, arises, moulding, steps, terrazzo, or special floor finishes, staircases, and balustrades, door and frames, plaster, angles, lighting and sanitary fittings, glass, paint work and all Finishes.

b) The contractor shall provide all necessary temporary lighting required during the progress of the work and suitable night lighting for the proper protection of the works.

c) No night work shall be done without the permission of the employer, and when permitted, adequate lighting shall be provided at the contractor's expense.

31. **VOUCHERS :**

Furnish the Employer / Architect with original voucher, on request, to prove that the materials are as specified.

32. **RUBBISH :**

a) Keep site clean and tidy at all times to the approval of the work.
b) Clear away all rubbish from time to time and on completion.

33. **ORIGIN OF MATERIALS :**

a) All material incorporated in the works shall be new and of the best quality obtainable. The Employer shall be the sole judge as to what materials are suitable for use in the works.

34. **ACCESS TO WORKS :**

a) No employee of the contractor, other than those authorised by the employer, shall be allowed to live on the site.

b) Proper and convenient means of access to all parts of the works shall be maintained at all times for the Employer and his representatives or other persons authorised by him.

35. **GATE KEEPER AND WATCHMEN :**

The contractor shall provide and pay the wages of all Gatekeepers and watchmen, for the effective protection of the works and materials at site. The Employer reserves the right to appoint such persons to be paid by the contractor.

36. **STORES ON THE SITE :**

Keep a store-book with :-

a) all folio numbered in ink, and

b) all entries in ink to show materials received, issued for use on site and the balance, leftover from time to time.

c) Allow the Employer free access of store-book at all reasonable times.

37. **VARIATION ORDERS :**

Obtain "Variation Orders" for items and rates not covered by the Schedule of Quantities within seven days of, verbal or otherwise, instructions from the Employer/Architect's.

38. **SUB-CONTRACTORS :**

a) The contractor shall as soon as practicable, before the execution of the contract, notify the Employer/Architect's, in writing, of the sub-contractors if any.

b) Nothing contained in the Contract Documents shall create any contractual relationship between the sub-contractor and the Owner/Employer.

39. **SITE - ENGINEER :**

The contractor shall depute at site, qualified and well experienced Project Engineer, to look after day to day work activities and to ensure the work time schedule.

40. **BATCH MIXING PLANT :-**

The Contractor shall provide and maintain in perfect working condition at all times, suitable batch mixing plant of suitable capacity at site, as instructed/advised by the Owner / Architect, along with suitable stores for stacking of all raw materials required, along with the proper electrical connections including all necessary concrete testing and pouring equipments as necessary and advised.

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3.7 - SPECIAL CONDITIONS OF TENDER (B)

1. For the supply of structural steel and reinforcement rods PLEASE SEE SCHEDULE "A" OF THE TENDER, if provided for and NOTES.

2. The Employer will try his best to make available water at site of the complex, free of cost to the contractor. The contractor shall provide his own pipe line and pumping unit and tap the same or make the necessary arrangement from the position as directed by the Employer. Please note that if the supply of water is not made available, the contractor has to make his own arrangement so the progress of the work will be maintained.

3. Electricity will be provided by the Employer at site AT COST at one point only at the time of construction and will be metered at the rate fixed by the Respective State Electricity Board for consumption purposes. The contractor has to make the necessary arrangement for meter, distribution system as per the rules and regulations of State Electricity Board.

4. The contractor will get approved the construction, shop and structural fabrication drawings prior taking up any construction work at site. Such construction drawings shall be sent directly to Mr. Ninad S. Patil, Mr.Yugandhar Ninad Patil, M/s. Shivaji D. Patil, S 12, 15, 16, Utility Centre, Opp. Rajiv Gandhi Bhavan, Sharanpur Road, Nashik, in triplicate, for his approval, and any changes, modification, if necessary, shall be carried out with the consultation of the Architect. The contractor shall obtain the approval to all the construction and shop drawings, in advance, prior execution of the work.

5. All running bills shall be got checked and approved for their correctness from Mr. Ninad S. Patil, Mr.Yugandhar Ninad Patil, M/s. Shivaji D. Patil, Consulting, Architect - Structural - Civil Engineer, before the payment shall be released to the contractor.

6. The Employer reserves to himself, the right of altering the drawings, nature of work and adding to or omitting any items of work or having portions of the same carried out departmentally or otherwise and such alterations or variations shall be carried out without prejudice to this contract.

7. The contractor shall, before the execution of the contract, notify the Employer in writing, the name of sub-contractors, if any, to get the consent in writing of the Employer. Do not sub-let to other persons any parts of the works without the consent in writing of the Employer.

8. Contractor shall provide for all necessary storage places at the site, within specified areas, for all materials such as timber, cement, lime, steel, electrodes and such other materials, which are likely to deteriorate by the action of sun, wind, rain, or other natural causes. The stocking of the construction material, such as bricks, gravel, sand, steel, etc. shall be in such a manner so as to facilitate rapid and easy checking of their quality and quantities.

9. Figured dimensions are to be taken in preference to scaled, Large scale details supersede small scale and all dimensions shall be checked by the contractor and discrepancies, if any, shall be referred to the Employer prior to the execution of the work.

10. Time is the essence of the contract. The contractor shall complete the whole work within the time stated in the tender subject to the conditions of contract, and shall co-operate with the employer from time to time in the preparation of time and progress chart for his use; broadly 1/4 work in 1/4 time, 1/2 work in 1/2 time, 3/4 work in 3/4 time and complete the work within the tendered time. If he fails to complete the work within the time limit, the contractor shall pay the sum indicated in the Appendix to the conditions of contract as ascertained and liquidated damages for each week or part of a week, that the works remain incomplete, after the specified date of completion.

11. The contractor shall furnish to the Employer and to the Architect all particulars for compiling weekly progress report.

12. The term "The Architect" Consulting Engineer in the said condition shall mean the said M/s. Shivaji D. Patil, FIE M.S., (USA), Mr. Ninad S. Patil, B.Arch. , Mr. Yugandhar N.Patil, M.E, or their authorised representative approved by them.

13. All materials incorporated in the works shall be new and of the best quality obtainable. The employer shall be the sole judge as to what materials are suitable for use in the works.

14. Measurement will be taken once in month and the value of work for interim certificate excluding the cost of material supplied by the owner will not be less than Rs. 25,00,000/-

15. The earnest money deposit as per tender notice shall be deposited along with the tender form and the balance amount to make up the total amount of 4% will be collected such that 2% shall be collected at the time of award of work and the balance shall be collected before 50% of the contract work is completed from the running bills of the contract work.

PERFORMACE SECURITY DEPOSIT
ADDITIONAL PERFORMANCE SECURITY ;- Bank Guarantee OR Demand Draft for Performance Security Deposit for Quoting Offer More than 1% below the tender cost. (As Per GR. Dated 12.04.2017).
As per the directives laid down in Government Of Maharashtra, Public Works Department, Marathi Resolution No. CAT 2017/PRA.KRA 8/ Bldg-2/dt. 12.04.2017, If the bidder intends to quote his offer below more than 1 % of the Bid cost of the department then such bidder should upload a Bank Guarantee OR Demand Draft (in the form as prescribed by Government) from any Schedule Bank or Nationalized Bank against Additional Performance Security in Part-II Financial Bid as mentioned below.
A) If the Bidder intends to quote his offer below more than 1 % up to 10 % of the estimated cost put to Bid then he should submit a Bank Guarantee OR Demand Draft amounting to 1% of the Bid cost of the department towards Additional Performance Security and scanned copy of Bank Guarantee OR Demand Draft shall be uploaded in Part-II Financial Bid
B) If the Bidder intends to quote his offer more than 10 % below the estimated cost put to Bid then he should submit Performance security 1 % for every percent after 10 % below percentage in addition to the cost of 1% performance security mentioned above clause A for quoting below offer, scanned copy of Bank Guarantee OR Demand Draft shall be uploaded in Part-II Financial Bid
(Eg. If Bidder quotes his offer 14 % below the estimated cost put to bid, then he should submit 14 - 10 = 4 % Additional Performance security + 1% = 5 % amount of the cost put to bid as a total Additional Performance Security.)
If the amount of Additional Performance Security as required above (under A & B) is not submitted by the bidder along with Part II Financial Bid, then his offer will be treated as ''Non Responsive" and will not be considered.
1) Such Bank Guarantee OR Demand Draft shall strictly issued only by the Nationalized Bank or Scheduled Bank in favour of the Client and shall be valid up to more than 1 month from the period of Defect Liability Period
2) The Bank Guarantee OR Demand Draft should bear the MICR and IFSC Code Number of the issuing bank.
3) The scanned copy of this Bank Guarantee OR Demand Draft shall be uploaded in Part-II Financial Bid (Financial Offer) of the bid. The Hard Copy of this Bank Guarantee OR Demand Draft shall be submitted in the office of the concerned Client in "sealed envelope" within one working day from the date of receipt of bid. The bidder shall write the 'Name of Work,' 'E- Tender No.' and 'Tender Notice No.' on such sealed envelope addressed to the concerned Client.
4) The amount of Additional performance security of successful contractor shall be refunded within the period of one month after the date of completion of defect liability period.
5) If at the time of submitting the below offer as stated above, contractor has submitted the required Demand Draft then after completing the tender process the Demand Draft of the Lowest bidder will be returned to him if the Bank Guarantee of the required amount valid up to the period of the Defect Liability period submitted by the contractor.
Note :- for calculating the amount of ADDITIONAL PERFORMANCE SECURITY contractors offer will be calculated in percentage rounded up to two decimal points only.

16. All work shall be carried out as per the construction specification enclosed and as per the relevant International Standards / I.S. standard / P.W.D. Hand Book / and as per the local norms, if the items are not covered in the enclosed specifications.

17. The contractor shall depute a permanent qualified and experienced Project Engineer (Civil) at site and also the necessary qualified and experienced supervising staff at site from the date of work order till the completion of the tendered work. The name, qualification and experience of the Project Engineer (work site) shall be given to the Architect and Employer, within a weeks time from the work order and prior to the line out of the work.

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3.8- PRICE VARIATION CLAUSE

If during the operative period of the Contract as defined in condition (i) below, there shall be any variation, in the Consumer Price Index (New Series) for Industrial Workers for Mumbai/applicable Centre as per the Labour Gazette published by the Commissioner of Labour, Government of Maharashtra/local government and/or in the whole-sale Price Index for all commodities prepared by the Office of Economic Adviser, Ministry of Industry, Government of India/Local Government, or in the price of petrol / oil and lubricants and major construction materials like bitumen, cement, steel, various types of metal pipes etc. then subject to the other conditions mentioned below, price adjustment on account of

(1) Labour Component
(2) Material Component
(3) Petrol, Oil and Lubricants Component
(4) Bitumen Component
(5) HYSD & Mild Steel Component
(6) Cement Component
(7) C.I. and D.I.Pipes Component

Calculated as per the formula hereinafter appearing, shall be made. Apart from these, no other adjustments shall be made to the contract price for any reasons whatsoever. Component percentage as given below are as of the total cost of work put to tender. Total of Labour, Material & POL components shall be 100 and other components shall be as per actuals.

(1)	Labour Component – K1	**30% (Thirty Percent Only)**
(2)	Material Component – K2	**33.73 %(Thirty Three Points Seventy Three Percent Only)**
(3)	POL Component – K3	**4% (Four Percent Only)**
(4)	Bitumen Component	Actual
(5)	HYSD, Mild Steel, TMT Bars, Structural Steel Component	**26.87% (Twenty Six Point Eighty Seven Percent Only)**
(6)	Cement Component	**5.40% (Five Point Fourty Percent Only)**
(7)	C.I. and D.I.Pipes Component	Actual

Note :- If Cement, Steel, Bitumen, C.I.& D.I.Pipes are supplied on Schedule 'A', then respective component shall not be considered. Also if particular component is not relevant same shall be deleted.

1. Formula for Labour Component :-

$$V1 = 0.85\ P\ [\ \frac{K1}{100}\ X\ \frac{L1 - Lo}{Lo}]$$

Where,

V1 = Amount of price variation in INR/USD/EQuivalent to be Allowed for Labour component.

P = Cost of work done during the quarter under Consideration minus the cost of Cement, HYSD and Mild Steel, bitumen, C.I. & D.I. Pipes calculated at the basic star rates as applicable for the tender, consumed during the quarter under consideration.

Star rates for the said materials shall be considered as under :-

1) Cement– Rs.**275/-** Per Bag **(Rs. Two Hundred Seventy Five Only)**
2) HYSD/Mild/Steel/TMT Bars – **Rs. 42600/- (Rs. Fourty Two Thousand Six Hundred Only).**
3) Structural Steel – **Rs.44100/-** (**Rs. Fourty Four Thousand One Hundred Only**).
4) Bitumen –
5) C.I. & D.I. Pipes – INR/USD/Equivalent

K1 = Percentage of labour component as indicated above.

L0 = Basic consumer price index for Mumbai/applicable centre shall be average consumer price Index for the quarter preceding the month in which the last date prescribed for receipt of tender, falls.

L1 = Average consumer price index for Mumbai/applicable centre for the quarter under consideration.

2. Formula for Materials Component :-

$$V2 = 0.85\ P\ [\ \frac{K2}{100}\ X\ \frac{M1 - Mo}{Mo}]$$

Where,

V2 = Amount of price variation in INR/USD/Equivalent to be Allowed for Materials component.

P = Same as worked out for labour component.

K2 = Percentage of material component as indicated above.

M0 = Basic wholesale price index shall be average wholesale price index for the quarter preceding the month in which the last date prescribed for receipt of tender, falls.

M1 = Average wholesale price index during the quarter under consideration.

3. Formula for Petrol, Oil and Lubricant Component :-

$$V3 = 0.85\ P\ [\ \frac{K3}{100}\ X\ \frac{P1 - PO}{PO}]$$

Where,

V3 = Amount of price variation in INR/USD/Equivalent to be Allowed for POL component.

P = Same as worked out for labour component.

K3 =Percentage of Petrol, Oil & Lubricant component.

PO =Average price of HSD at Mumbai/applicable centre during the quarter preceding the month in which the last date prescribed for receipt of tender, falls.

P1 =Average price of HSD at Mumbai/applicable centre during the quarter under consideration.

4. Formula for Bitumen Component :-

V1 = QB (B1 - B0)

Where,

V1 = Amount of price variation in INR/USD/Equivalent to be allowed for Bitumen component.

QB = Quantity of Bitumen (Grade (I)) in metric tonnes used in permanent works and approved enabling works during the quarter under consideration.

B1 = Current, average ex-refinery price per metric tonne of Bitumen (Grade (I)) under consideration including taxes (octroi, excise, sales tax) during the quarter under consideration.

B0 = Basic rate of Bitumen in INR/USD/Equivalent per metric tonne as considered for working out value of P or average ex-refinery price in INR/USD/Equivalent per metric ton including taxes (octroi, excise, sales tax) of Bitumen for the grade of bitumen under consideration prevailing quarter preceding the month in which the last date prescribed for receipt of tender, falls, whichever is higher.

5. Formula for HYSD and Mild Steel Component :-

$$V5 = \frac{S0\ (Sl1 - Sl0)}{Sl0}\ X\ T$$

Where,

V5 = Amount of price variation in INR/USD/Equivalent to be allowed for Bitumen component.

S0 = Basic rate of HYSD/Mild Steel in INR/USD/Equivalent per metric tonne as considered for working out value of P

Sl1 = Average Steel Index as per RBI / Local Reserve Bank Bulletin during the quarter under consideration.

Sl0 = Average of Steel Index as per RBI / Local Reserve Bank Bulletin for the quarter preceding the month in which the last date prescribed for receipt of tender, falls.

T = Tonnage of steel used in the permanent works for the quarter under consideration.

6. Formula for Cement Component :-

$$V6 = C0 \frac{(CI1 - CI0)}{CI0} \times T$$

Where,

V6 = Amount of price escalation in INR/USD/Equivalent to be allowed for cement component.

C0 = Basic rate of cement in INR/USD/Equivalent per metric ton as considered for working out value of P

CI1 = Average cement Index published in the RBI / Local Reserve Bank bulletin for the quarter under consideration.

CI0 = Average of cement Index published in the RBI / Local Reserve Bank bulletin for the quarter preceding the month in which the last date prescribed for receipt of tender, falls.

T = Tonnage of cement used in the permanent works for the quarter under consideration.

7. Formula for C.I./D.I.Pipe Component :-

V7 = Qd (D1 - D0)

Where,

V7 = Amount of price escalation in INR/USD/Equivalent to be allowed for C.I./D.I .pipe components.

D0 = Pig Iron basic price in INR/USD/Equivalent per tonne considered for working out value of P

D1 = Average Pig Iron price in INR/USD/Equivalent per tonne during the quarter under consideration (published by HSCO / Equivalent).

Qd = Tonnage of C.I./D.I .pipes used in the works during the quarter under consideration.

The following conditions shall prevail :-

i) The operative period of the Contract shall mean the period commencing from the date of work order issued to the Contractor and ending on the date on which the time allowed for the completion of the works specified in the Contract for work expires, taking into consideration the extension of time, if any, for completion of the work granted by the Engineer/Architect under the relevant clause of the Conditions of Contract in cases other than those where such extension is necessitated on account of default of the Contractor. The decision of the Engineer/Architect as regards the operative period of the Contract shall be final and binding on the Contractor. Where any compensation for liquidated damages is levied on the Contractor on account of delay in completion or inadequate progress under the relevant Contract provisions, the price adjustment amount for the balance of work from the date of levy of such compensation shall be worked out by pegging the indices, L1, M1, C1, P1, B1, Sl1, and CI1 to the levels corresponding to the date from which such compensation is levied.

ii) This price variation clause shall be applicable to all contractors in B1 / B2 & C form but shall not apply to piece works. The price variation shall be determined during each quarter as per formula given above in this clause.

iii) The price variation under this Clause shall not be payable for the extra items required to be executed during the completion of the work and also on the excess quantities of items payable under the provisions of Clause 38/37 of the contract from B1/B2 respectively. Since the rates payable for extra items or the extra quantities under Clause 38/37 are to be fixed as per current DSR/Schedule of Rates or as mutually agreed to yearly revision till completion of such work. In other words, when the completion / execution of extra items as well as extra quantities under Clause 38/37 of the contract from B1/B2 extends beyond the operative date of the DSR/Schedule of Rates then rates payable for the same beyond the date shall be revised with reference to the current DSR/Schedule of Rates prevalent at that time on year to year basis or revised in accordance with mutual agreement thereon, as provided for in the Contract, whichever is less.

iv) This clause is operative both ways, i.e. if the price variation as calculated above is on the plus side, payment on account of the price variation shall be allowed to the contractor and if it is

on the negative side, the Client shall be entitled to recover the same from the Contractor and the amount shall be deductible from any amounts due and payable under the contract.

i) To the extent that full compensation for any rise or fall in costs to the Contractor is not entirely covered by the provision of this or other clauses in the contract, the unit rate and prices included in the contract shall be deemed to include amounts to cover the contingency of such other actual rise or fall in costs.

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3.9 - BID CAPACITY OF CONTRACTOR

1. The tender will be qualified only if the Civil Contractor's available bid capacity is more than the total estimated value of works for which he has offered his bid. The available bid capacity will be calculated as under :-

Assessed Available Bid Capacity = (A*N*2) – B

A = Maximum value of Civil Engineering works executed in any one year during the last three years (updated to present year level).

N = Number of year prescribed for completion of works for which bid are invited.

B = Value at present year price level, of existing commitments and on going work to be completed during the next 10 months.

Note - The Statement 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 / Architect.

2. To qualify for award of the contract, each Tenderer in its name, should have in the last three years :-

a) Achieved a minimum annual financial turnover (in all classes of civil engineering construction work only) of Rs. **500** lakhs for 1,2 & 3 and Rs. 100 Lakhs for RCC Chimney & Fndn.in any one year.

b) Satisfactorily completed (from start to finish) as a prime contractor of at least one similar work value not less than Rs. **as above** lakhs in not more than one contract of present year price level. Financial turnover and cost of completed works of previous years shall be given weightage of 10% per year based on INR/USD/Equivalent Value to bring them to present year price level.

c) Executed in any one year, the following minimum quantities of work

i)	RCC	:	**300 Cum.**
ii)	Steel Work	:	**100 M.T.**

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NOTES

1) Cement (Local Cement sourced in India/Local approved and of approved make only) required for the Project shall be procured solely by the Civil Contractor. Alternatively , Client may provide cement at the basic rates mentioned herein below.

2) Mild, Twisted Steel ,Tor steel and Structural Steel (SAIL, TISCO, HSL, RINL or approved make only) required for the Project shall be procured solely by the Civil Contractor. Alternatively Client may provide steel at the basic rates mentioned herein below.

3) M.S. Precoated Sheets, M.S.Precoated PUF Sandwich Panel Sheets/ Galvalume sheets required for the Project shall be procured solely by the Civil Contractor. Alternatively, Client may provide the said materials at the basic rates mentioned herein below.

4) Sand used for constructional purposes shall only be local / River Sand and shall be washed at the source if necessary and shall confirm to the specifications as enclosed herein. Washing of sand at site will not be permitted.

5) Curing for all works as per specifications, is the responsibility of the civil contractor. However, in the event that the Client/Architect/Engineer, is not satisfied with the curing being done at site, the Client may carry out the curing works and in such eventuality, 2% (Two Percent Only) of the value of the cement concrete/masonry etc. works, will be deducted by the Client from the contractor's bill amount

6) Water required for the project works will be made available by the Client, at one point only, free of charge. The Contractor has to make his own arrangement for distribution lines, as per the rules and regulations and site instructions of the Engineer-in-Charge.

7) Electricity required for the project works will be made available by the Client at Costand metered and provided for consumption purposes as per the local electricity board norms. The Contractor has to make his own arrangement for distribution lines, as per the rules and regulations and site instructions of the Engineer-in-Charge.

8) The selected contractors have to execute the Contract Agreement on the basis of the work order and standard terms and conditions of the Contract Agreement which are enclosed with this Tender Set.

9) For any materials if supplied by the Client as per Note No.1 , 2 & 3 above, it shall be the responsibility of the civil contractors, to load/unload and properly store the materials at site, as per tender terms and conditions. The civil contractor will also be responsible for any thefts and damages and to maintain proper indents of the materials issued to them (the civil contractor) by the Client stores, which may be checked from time to time by the Client civil department and/or the Architect/Engineer of the Client. In such case, if there is any theft or damage, the contractor shall make good such loss by substituting equivalent category and quality of steel at his own cost, with the knowledge of the employers(Client). Failure will entail recovery at the rates. In the event of the fact that steel wastages and/or short length cuttings etc. are not to be taken in the account for the purpose of measurement under respective items for the structural steel and steel for R.C.C. work, which are provided in the schedule of quantities, the quantities of steel issued are likely to be more than the quantities of steel actually used and measured for the specific item of work, the allowable wastage then shall be considered at 3% of the total quantities measured for the respective items of works. Any excess wastage made by the contractors shall be charged at the rate of Rs. 42,600.00 (Rupees Fourty Two Thousand Six Hundred Only) per M.T. for M.S./Tor, round bars and Rs. 44,100.00 (Rupees Fourty Four Thousand One Hundred Only) per M.T. for structural steel, and the said amount shall be recovered from the bills of the contractors. Final bills of the civil contractor shall not be certified and adjusted unless these items are accounted for properly and finally. The quantities of steel in wastages shall be the property of the employers (Client). The cost of all the materials as supplied by the Client will be deducted from the R.A.Bills of the civil contractor for the quantities used upto the stage of work for which the bills have been prepared.

10) All taxes including V.A.T., Labour Welfare Cess, Labour Insurance Tax, Royalty, Works Contract Tax, Service Tax, and any other local taxes and Cess payable as per Government Statutory norms etc. are to be paid by the Contractor. GST will be paid separately by the client & is to be reflected separately in the bills of the Civil Contractor.

11) Clarification, of any item work, Specification, Contract Condition, Schedule of Quantity, Rates, Printing and Typing etc. shall be got clarified prior to filling and submission of the tender to the Client. After submission of the Tender and Work Order, the clarification and decision and ruling of the Client Architect will be final and binding.

13) Time is essence of the Contract. The work has to be got completed within the stipulated time limit from the date of the Work Order. The work progress shall be 1/4th work in the 1/4th time, 1/2 work in half time, 3/4th work in 3/4th time and complete work within the time limit.

14) I/We have visited the Proposed Work Site and satisfied myself/ourselves as to the location of work site, labours, material, transport arrangement, to be made, leads of various material along with the source of supply, and hereby submit the unconditional tender in my percentage quotation accepted and signed each and every page of the Tender Form.

15) I/We have gone in detail through the Contract Condition, Special Conditions of the Contract, Detailed Construction Specification, Schedule of items and Rates, tender definitive drawings which were made available at the Office of the Architect/Engineer and agree to carry out the entire work to the satisfaction of the Client Project and Planning Authority and Consulting Architect Engineer of the Client.

16) Basic Rates/Star Rates for the various construction materials shall be considered as under :- 1) Cement - Rs. 5500.00 (Rupees Five Thousand Five Hundred Only) per M.T, (2) Mild Steel - Rs. 42,600.00 (Rupees Fourty Two Thousand Six Hundred Only) per M.T (3) Structural Steel - Rs. 44,100.00 (Rupees Fourty Four Thousand One Hundred Only) per M.T (4) TMT/Fe500 - Rs. 42,600.00 (Rupees Fourty Two Thousand Six Hundred Only) per M.T (5) M.S.Precoated Sheets - Rs. 426.00 (Rupees Four Hundred Twenty Six Only) per Sqm (6) Galvalume Self Supporting Sheets - Rs. 1200.00 (Rupees One Thousand Two Hundred Only) per Sqm. (7) M.S.Precoated PUF Sandwich Panel Sheets 35mm thick - Rs. 1300.00 (Rupees One Thousand Three Hundred Only) per Sqm, (8) Sand - Rs. 1575.00 (Rs.One Thousand Five Hundred Seventy Five Only) per Cum, (9) Crushed Metal (Aggregate) - Rs. 900.00 (Rs. Nine Hundred Only) per Cum, (10) Bricks (IInd Class) - Rs. 7.00 (Rs. Seven Only) per No., (11) Rubble Stone blasted - Rs. 473.00 (Rs. Four Hundred Seventy Three Only) per Cum.,(12) Murum - Rs. 225.00 (Rs. Two Hundred Twenty Five Only) per Cum., These rates however are to be considered as basic rates only if the material is to be supplied by the Client and any rate difference in actual and these rates will not be considered to be added to the Contract Price, where only the Price Variation Clause (if applicable), will be considered.

17) The Contractor shall, necessarily arrange for all permits including Work Permits and all statutory approvals for Labour, Machinery and materials as necessitated and laid down as per the statutory norms of the Local and Central Governments and produce and submit all such permits to the Client prior taking up / mobilising any work at site. The Client will in no way be responsible for any damages arising out of non-compliance of any statutory norms on part of the Civil Contractor and/or his Sub-Contractors/Agencies.

18) The Civil Contractor shall necessarily install Batch mixing plant of appropriate capacity at specified location at site and shall ensure design mix concrete for all concreting works necessarily.

19) References for the various Schedule "B" items, Specifications, Contract Terms and Conditions etc. are based on and are as per the Indian/Equivalent Standards, Indian/Equivalent Codes and practices of the Public Works Department, PWD/CPWD (India/Equivalent). However, similar relevant and approved local codes of Constructions and Standards may be followed and read in conjunction with the Indian/Equivalent Codes for all purposes of this tender document, including taxation etc. The decision and interpretation of these laws and codes, by the Client and its Consultants and Planning Authority shall be final and binding on all the agencies. The Civil Contractor shall get himself acquainted with the relevant Indian/Equivalent Standards, necessarily prior quoting the tender, and carry out the works as per the Instructions of the Client, Client Consultants and Client Planning Authority.

20) Tender Conditions and Clauses appearing subsequently in the Tender Terms and Conditions, will generally take precedence over any earlier pertaining and relevant clauses, necessarily, for all purpose of this Tender and Contract Document/s and any decision of the Client, Client Consultants and Client Planning Authority in the matter would be final and binding.

21) The Contract is a definite percentage rate contract / labour rate contract, with, the Price-Variation Clause, and the Civil Contractor shall not claim any fluctuation in the price and the contract price shall not be subjected to any rise and fall of prices, except for the Price Variation Clause (only if applicable). Client will not be responsible for any hikes in material rates if not reflected within the Price Variation Clause (if applicable).

SHIVAJI D. PATIL, FIE, M.S. (U.S.A.) Architect – Engineer Nashik 422 002.	**NINAD S. PATIL Architect** Nashik 422 002.	**YUGANDHAR N.PATIL M.E. (STRUCT) (USA)**	**OWNER**	**CONTRACTOR**

5. PROJECT INFORMATION

1	PROJECT TITLE	:	**DISTILLERY AND INCINERATION BOILER CIVIL WORKS**
2			
3	PURCHASER	:	**MULA SSK LTD.**
4	FACTORY	:	**MULA SSK LTD.** P.O :- Sonai, Tal :- Newasa, Dist :- Ahmednagar 414 105.
4.	PURCHASER'S ADDRESS FOR COMMUNICATION	:	Same as above
5.	CONSULTANTS	:	M/S.SHIVAJI D.PATIL, MR.NINAD S.PATIL, Mr.YUGANDHAR N.PATIL.
6.	CONSULTANT'S ADDRESS FOR COMMUNICATION	:	S12,15,16, 2nd Floor, Utility Centre Opp.Rajiv Gandhi Bhavan, Sharanpur Road Nashik 422 002, Maharashtra, India Attn.:- Mr. Ninad Shivaji Patil, Architect Mr.Yugandhar N.Patil. Tel : +91 253 2581016 Email : nspatil_nsk@yahoo.com,
7.	PLANT LOCATION	:	Same as above.
8	NEAREST AIRPORT	:	Shirdi Airport
9	PORT OF DISEMBARKATION	:	Mumbai Port
10.	AMBIENT TEMPERATURE (°C)		
	MAXIMUM	:	42 Degrees
	MINIMUM	:	22 Degrees
11.	RELATIVE HUMIDITY (%)		
	A. MAXIMUM	:	60%
	B. MINIMUM	:	14%
12.	RAINFALL (YEARLY)	:	mm
13.	ALTITUDE	:	M above M.S.L.
14	SEISMIC COEFFICIENT	:	As per Indian/Equivalent Standards.
15.	WIND		
	A. DIRECTION	:	North West-South East
	B. DESIGN WIND VELOCITY	:	As per Indian/Equivalent Standards
16.	CLIMATIC CONDITIONS	:	Humid
17.	Construction power	:	Electricity as per Indian/Equivalent Standards

with effectively earthed neutral will be made available at only one point. Bidder's scope shall include complete distribution beyond this point including hardware required for the same.

SHIVAJI D. PATIL, FIE, M.S. (U.S.A.) Architect – Engineer Nashik 422 002.	**NINAD S. PATIL Architect** Nashik 422 002.	**YUGANDHAR N.PATIL M.E. (STRUCT) (USA)**	**OWNER**	**CONTRACTOR**

6. CONSTRUCTION SPECIFICATIONS

C O N T E N T S

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CONSTRUCTION SPECIFICATION
FOR
ROUGH GRADING

SECTION I

1.0 **SCOPE :-**

This specification covers furnishing all labour, materials and equipment, and performing the necessary work to complete the clearing and grubbing and the excavating, filling, rough grading and consolidation and compacting indicated on the approved drawings and specified herein.

2.0 **CLEARING AND GRUBBING :-**

Within the grading limits shown, all shrubs, stumps, vegetation and jungle, including roots, shall be removed and burned except as directed by the Engineer / Architect.

3.0 **EXCAVATION :-**

3.1 Excavation shall consist of performing all operations necessary to excavated to the line and grade shown on the drawings. Excavation will include earth, weathered rock and hard rock. Whenever finishing grade is referred to, it shall mean to elevations indicated on the drawings plus or minus thirty millimeters. For descriptive and payment purposes, excavation shall be classified as follows:-

3.2 Earth excavation shall be defined as unconsolidated, or consolidated material which can be broken with a pick.

3.3 Weathered rock shall be defined as consolidated or cemented material which can be broken with a pointed pry bar or pick.

3.4 Hard rock shall be defined as competent consolidated material with few fractures that cannot be broken with a pointed pry bar and must be blasted.

3.5 Ditch or channel excavation shall be defined as that excavation between the invert of the channel and the point at which the channel side slope intersects natural or finish grade, whichever is lower.

4.0 **FILLING :-**

Filling shall consist of performing all operations necessary to place the fill to the line and grade shown on the drawings. Filling shall be placed in layers that are not over 150 mm thick before compaction, then watered and compacted as hereinafter specified. In platforms for structures, roadbeds, the top 150mm shall not contain lumps or rock of 60mm size or larger. When filling is to be placed against hillsides or existing fill, the material consists of large rock material or hard lumps which cannot be readily broken, such material shall be well distributed throughout the fill, and sufficient earth or other fine material as it is deposited, so as to fill the interstices and produce a dense compact fill.

5.0 **WATERING :-**

Watering for compacting backfill material and water required for laying dust caused by grading operations shall be applied as directed by the Engineer. The water shall be applied so as to obtain the optimum moisture content for compaction. The application of water will be by a distributor equipped with a spray system that will ensure a uniform application of water. At the direction of the Engineer, water may be applied to the excavation area from which the fill is obtained.

6.0 **COMPACTION :-**

6.1 All fill shall be compacted by road rollers, tamping rollers, or by tamping, as specified herein.

6.2 All areas within the bench area of buildings marked, compaction of all roads, shall be compacted by tamping rollers and / or road rollers. The layer excluding the top layer shall be compacted by not less than four passes with the tamping roller. Before the last layer is placed the road roller shall make one pass over the area. The last layer shall then be placed and compacted with the road roller by making not less than four passes.

6.3 The balance of the fill may be compacted by using air operated or hand rammers, as directed by the Engineer.

6.4 Tamping rollers shall be a metal drum surrounded with metal studs with tamping feet projecting not less than 160mm from the surface of the drum. The tamper feet shall be arranged in rows spaced not less than 150mm, nor more than 300mm on centre. The load on each foot shall not be less than 250 pounds per square inch (17.58 kg/sq.cm.). The load per foot will be determined by dividing the roller weight by the cross-sectional area of one row of feet across the roller.

6.5 Road roller shall be three wheeled and weight not less than 12 tonnes and shall produce a compression on the rear wheel of not less than 325 pounds per liner inch (60 kg per liner cm) of wheel width.

6.6 Rammers shall have a base area of at least 28 square inches (182 sq. cm.).

7.0 **WEED KILLER :-**

All roadway base shall be treated with a commercial weed killer applied according to the manufacturer's recommendations.

8.0 CIVIL WORKS REQUIREMENTS

8.1 GENERAL ITEMS

1. **Scope of Work**

The scope of permanent works includes the construction of all earthworks associated with site leveling and embankments, mass and reinforced concrete foundations to machinery and buildings incorporating all holding down bolts and all site roads, hard-standing and drainage for the structures as per tender notice.

2. **Materials**

- If required the Contractor shall deliver samples of materials to the Employer's Representative for approval.

Materials used in the works shall be new and as specified and equal to any approved sample. Sufficient time shall be allowed for the approval or testing of materials before such materials are required to be ordered. The Employer's Representative shall have the right to reject any material that is damaged or has deteriorated and such materials shall be removed from site immediately.

Branded materials shall be handled, stored and used, and processes shall be carried out strictly in accordance with the manufacturer's instructions and recommendations.

The Indian or British Standards define exactly the quality of materials to be used and the procedures to be followed in testing of materials.

The Employer's Representative may require the Contractor to obtain at his own expense a certificate in respect of any material stating that it is in accordance with the relevant Indian or British Standard Specification.

Materials used in the work for which no Indian or British Standard Specification has been published shall be of a Standard that is satisfactory to the Employer's Representative.

3. **Elevations and Benchmarks**

Except where otherwise specified, all elevations will be in meters above mean sea level with an accuracy of two decimals. The data for all levels will be based on Benchmarks. The Contractor, on his own responsibility, shall ensure that the Works are constructed in relation to this data. Benchmarks and other points of reference in the vicinity of the Site may be indicated on the Drawings and the appropriate data thereof will be supplied to the Contractor.

8.2 DEMOLITION AND SITE CLEARANCE

1. **General**

All buildings, structures and superficial obstructions shall be demolished, broken up and removed. Each part of the site shall be cleared at times and to the extent required or approved by the Employer's Representative. All materials arising from demolition which are surplus to or unsuitable for use in the works shall become the property of the Contractor and shall be disposed of by him in accordance with Section II – 15.0.

2. **Removal of Termite Hills**

All termite hills shall be demolished and the surplus material removed to tip. The cavity formed by the removal of the termite hill shall be treated with the solution specified below in "TERMITE PROOFING" and then filled with approved material in the specified manner for in-filling trenches.

3. **Termite Proofing**

Termite Proofing shall be undertaken over the whole area of the buildings and aprons and shall consist of the application of a solution of 5 parts pentachlorophenol and 95 parts of furnace oil (by weight) well mixed together and applied by means of watering cans with fish tail spouts at a rate of 5 liters per m^2. Before treatment the surface must be cleared of all rubbish and in particular scrap timber. The treatment shall be on the ground after removal of the top soil and/or soft layer before making up levels.

4. **Site Clearance**

The site of the works shall be cleared of all trees, bushes and vegetation. Trees and bushes shall be uprooted and raked into windrows and burnt. Holes left by stumps and roots shall be filled with suitable material and compacted as specified.

Mature trees required to be preserved for landscaping purposes will be indicated and marked by the Employer's Representative before site clearance commences. The Contractor shall take all necessary precautions to protect such trees from damage during all phases of the works.

8.3 EARTHWORKS

1. General

The following Sections shall apply to all excavations except where covered elsewhere in the specification.

The excavation and fillings shall be carried out in such manner and order as the Employer's Representative may direct.

The following definitions of the earthworks materials shall apply to this and other Sections of the Specification in which reference is made to the defined materials:

a) 'Top Soil' shall mean the top layer of soil containing more than 5% by weight of organic matter.

b) 'Suitable material' shall comprise all that which is acceptable in accordance with the Contract for use in the Works and which is capable of being compacted in the manner specified in Section II – 13.0, to form a stable fill having side slopes as indicated on the Drawings.

c) 'Unsuitable material' shall mean other than suitable material and shall include:

   (i) material from swamps, marshes or bogs;

   (ii) peat, logs, stumps and perishable material;

   (iii) material susceptible to spontaneous combustion;

   (iv) clay of liquid limit exceeding 80 and/or plasticity index exceeding 55;

   (v) materials having an in situ moisture content greater than the maximum permitted for such materials in the Contract unless otherwise permitted by the Employer's Representative.

d) 'Rock' shall mean material which in the opinion of the Employer's Representative requires the use of wedges, pneumatic tools or blasting to enable the excavation to be completed, but specifically excludes isolated volumes of rock or other hard material of up to one cubic meter in content.

e) 'Rippable soft rock' shall mean material which, in the opinion of the Employer's Representative, requires the use of tractor drawn tines to break up the material. These rocks will, in general, be weathered sandstones and other sedimentary rocks.

f) 'Ordinary ground' shall mean material which in the opinion of the Employer's Representative can be excavated by normal excavation machinery.

CONSTRUCTION SPECIFICATION
FOR
STRUCTURAL EXCAVATION
AND
FINE GRADE

SECTION II

1.0 **SCOPE :-**

The work covered by this specification includes furnishing all labour, materials, equipment and performing the operations necessary to complete the excavation and filling required, for all buildings; structures and foundations; and the fine grading as shown on the approved drawings and specified herein.

2.0 **EXCAVATION :-**

The contractor shall perform all excavation required for the various structures and foundations. All excavation shall be to line and grade required for the proper installation and removal of the forms and to facilitate the construction. Excavation for all foundations shall be carried one meter below the floor slab for interior footing or one meter below the finished grade for wall footings and exterior footings, except as noted.

3.0 **BACK- FILLING :-**

After all below grade work has been completed and all debris has been removed, the excavated area shall be backfilled. The backfilled material shall be the excavated material and it shall be placed in 150 mm layers.

4.0 **COMPACTION :-**

All backfill areas shall be well watered and well compacted by ramming as directed by the Engineer.

5.0 **SHORING AND BRACING :-**

The contractor shall furnish and install all shoring, bracing and sheeting as required to adequately support the excavation and to provide safety for the personnel. This shoring shall be removed as the backfilling takes place.

6.0 **FINE GRADE :-**

The contractor shall furnish and install the sand or gravel sub-grade below the floor slabs. This sub-grade shall be levelled and compacted. Exterior fine grade will include cutting, filling and compacting so as to provide a proper drawing away from buildings and structures.

7.0 **EARTHWORKS GENERALLY**

No excavated suitable material, other than surplus to requirements of the Contract, shall be removed from the Site without the permission of the Employer's Representative. Should the Contractor be permitted to remove suitable material from the Site to suit his operational procedure, then he shall make good at his own expense any consequent deficit of filling arising there-from.

Where the excavation reveals a combination of suitable and unsuitable materials the Contractor shall, unless otherwise agreed by the Employer's Representative, carry out the excavation in such a manner that suitable materials are excavated separately for use in the Works without contamination by the unsuitable materials.

The Contractor shall dispose of excavated materials in such a manner and, at such time, as provided for in the Contract.

8.0 **LIMITS OF EXCAVATION**

The excavation shall be carried out to the lines, levels, widths and depths shown on the drawings.

Before commencing any excavation the Contractor must satisfy himself as to the accuracy of the levels shown and bring to the notice of the Employer's Representative any discrepancies.

Excavations shall be suitably trimmed and leveled before oversite concrete is placed. In locations where the material is subject to softening, a bottom layer of soil approximately 75 mm thick shall be left in and removed immediately before the placing of concrete.

In the event of over-excavation, the area shall be filled with selected excavated material or Grade 10 concrete. If such over-excavation is carried out on the Employer's Representative's instructions, then the Employer will bear the cost which shall be charged at the rates in the Bill of Quantities.

9.0 **PROTECTION OF EXCAVATIONS**

The faces of excavations shall be retained with sheeting, timbering, strutting and shoring as necessary to protect the workmen and to prevent damage to adjacent services and structures.

If, in the opinion of the Employer's Representative, sufficient support of the excavation is not being provided and the work is dangerous to workmen or property or to permanent work, the Employer's Representative may suspend operations until sufficient timbering or sheeting is provided.

The Contractor must take every precaution against slips or falls and should any occur he shall remove the surplus at his own expense as required by the Employer's Representative.

All necessary temporary drains and culverts shall be constructed to keep the site free of water. Trenches and excavations shall be kept free of surface water by pumping or other means.

10.0 **APPROVAL OF BOTTOMS OF EXCAVATION**

The Contractor shall report to the Employer's Representative, at least 24 hours before concreting is required, when suitable bottoms to the excavations have been reached. Any further work executed before the excavations have been inspected and approved shall, if required by the Employer's Representative, be removed and new work substituted after the excavations have been approved, at the Contractor's expense.

11.0 **INFILLING OF CHANNELS, TRENCHES AND PIPES**

When no longer required, all temporary channels, trenches or pipes which it may have been necessary to construct in or under the permanent work shall be filled with suitable material, approved by the Employer's Representative. Infilling shall be performed in layers not exceeding 300 mm thick and each layer thoroughly compacted to the satisfaction of the Employer's Representative.

12.0 **BLASTING**

The Contractor shall store explosives, if required, in a store or magazine provided with separate compartments for detonators. Explosives shall be handled by experienced and competent shot

firers. The Contractor shall ensure that there is no unauthorized issue or improper use of explosives brought on the Site.

Explosives shall be used in the quantities and manner recommended by manufacturers. The written permission of the Employer's Representative shall be obtained for each location or series of locations where the Contractor wishes to use explosives.

13.0 **FILLING BY EMBANKMENTS**

Suitable material arising from excavations shall be used where possible for filling on the Site, unless otherwise specified or required by the Employer's Representative.

Where insufficient suitable material is available from excavations approved suitable material from borrow areas may be used.

Borrow areas within the Site will be those areas specifically designated as such by the Employer's Representative.

Sand for filling, in making up levels, etc. shall be naturally occurring sand, or sand prepared by crushing natural stone.

The compaction achieved in filling will be measured by the following tests, carried out in accordance with Indian/British Standards 'Methods of Testing Soil for Civil Engineering Purposes'.

a) Density-Moisture Tests

b) Density Tests

The moisture content of the fill materials shall be adjusted as necessary to achieve the required compaction.

The minimum relative compaction to be achieved in the compacted areas shall be 100% of maximum dry density as measured above. Any material which, after repeated compaction, does not achieve this figure will be removed.

Filling in areas on which no roads, structures or services are to be constructed shall be spread in layers not thicker than 100 mm and subjected to as much traffic as possible during construction.

At the end of each day, the surface shall not be left with areas that can retain water and, if necessary, ditches shall be cut to ensure that this object is attained.

When the state of the weather is such that, in the opinion of the Employer's Representative, it would adversely affect the placing of compacted fill, all such work shall be stopped.

All filling material, whether placed and/or compacted or awaiting placing and/or compaction which, in the opinion of the Employer's Representative, does not comply with the specification or has been damaged by weather or in any other way, shall be removed and replaced at the Contractor's expense.

14.0 **FREQUENCY OF COMPACTION TEST**

Each layer shall be compacted satisfactorily before proceeding with the next layer, with a maximum thickness of 200 mm per layer. Tests will be taken in accordance with Section 13.0 at the discretion of the Employer's Representative.

15.0 **SURPLUS EXCAVATED MATERIAL**

The disposal of excavated material shall be carried out as required by the Employer's Representative.

All surplus excavated material, where so required, shall be removed and transported to a tip.

The location of such tip will be specifically designated by the Employer's Representative, within the overall Site or without.

16.0 **HARD CORE**

Hard core shall be sound approved uniformly graded stone of maximum size 150 mm.

17.0 **CLAY FOR LINING**

Clay used for impervious lining shall be excavated from borrow pits on site as required by the Employer's Representative. The location of borrow pits will be determined by the Employer's Representative on site during the progress of work. The maximum haul distance from borrow pits to areas requiring lining shall not exceed 4,000 meters.

18.0 **COMPACTION OF CLAY FOR LINING**

Materials for impervious linings shall be deposited in uniform layers, not exceeding 150 mm. The material shall be compacted so that it is homogeneous and free from lenses, pockets, streaks or other imperfections. Each layer shall be compacted using a 'sheepsfoot' roller of sufficient weight for proper compaction, by hand or power tampers or by other means and equipment approved by the Employer's Representative.

The dry density of the soil fraction in the compacted material shall not be less than 95 per cent of the laboratory standard maximum soil density (dry) as determined by Test as specified.

If the water content is less than that required for optimum compaction, water shall be added either at the site of excavation or at site of compaction as necessary.

If the water content is more than that required for optimum compaction the material shall be rejected for use or compaction shall be delayed until such time as the material has dried out to the optimum water content.

19.0 **STONE PITCHING**

Stone pitching shall be of sound, durable, crushed rock or natural stone as approved by the Employer's Representative and shall be uniformly sized between 100 mm minimum dimension to 150 mm maximum dimension.

The stone shall be hand placed in a single layer and bedded on a uniform surface of approved excavated material to give a uniform finished surface with maximum opening between contiguous stones of 25 mm.

Where shown on the drawings stone pitching shall be pointed with a mortar of 3 parts sand to 1 part cement.

20.0 **RIP-RAP**

Rip-rap shall be of sound, durable, crushed rock or natural stone as approved by the Employer's Representative and shall be uniformly sized at 200 mm nominal maximum dimension.

The stone shall be placed and spread to produce the minimum finished thickness shown on the drawings with a uniform finished surface.

21.0 **SEEDING**

Where shown on the drawings the Contractor shall seed with an approved variety of grass seed.

The ground shall first be rotovated to a depth of 300 mm, leveled and raked free of stones. Prior to sowing, the ground shall be well watered and seed then spread at the rate of 1 kilogram per 20 square meters. Seed will be covered by raking and the ground consolidated with a light roller.

The area will be watered daily by the Contractor until the site has been accepted by the Employer's Representative.

CONSTRUCTION SPECIFICATION
FOR
CONCRETE

SECTION III

1.0 **SCOPE :-**

The work covered by this specification includes furnishing all labour, materials, equipment and performing the operations necessary to complete the concrete work shown on the Approved Drawings and specified herein. The contractor has to prepare the working drawing alongwith the bar bending schedule in detail alongwith the form drawings from the R.C.C. drawing and shall get approved the same, prior taking up the actual work activities at site.

2.0 **APPLICABLE PUBLICATIONS :-**

All work shall be in accordance with the latest revision of the Indian / Equivalent Standard except where specifically noted otherwise : -

Plain and Reinforced Concrete	I.S.	456	
Cement	I.S.	269	
Aggregates	I.S.	383	
Structural Safety	I.S.	875	
Testing of Concrete	I.S.	516	
Sampling	I.S.	1199	
Compaction	I.S.	2505	I.S.2506
Rapid Hardening Cement	I.S.	8041	
Admixtures	I.S.	9103	
	I.S.	2645	

3.0 **MATERIALS :-**

3.1 Cement shall be ordinary portland cement conforming to I.S.269/Equivalent. All cement used in exposed concrete faces of the structure shall be of the same manufacturer. All cement shall be suitably protected from exposure to moisture until used. Special cement, if any, shall be used only after the approval of the Engineer/Architect.

3.2 **COARSE AGGREGATE :-**

Shall consist of approved sound crushed rock or gravel. It shall be free of organic matter or other deleterious material. Adequate supplies of coarse aggregate shall be stockpiled sufficiently in advance of construction to permit sampling and testing before use.

3.3 **FINE AGGREGATE :-**

Shall consist of approved natural sand, or crushed stone screenings combination of both and shall be hard and durable. It shall be free of organic matter or other deleterious material. Adequate supplies of aggregate shall be stockpiled sufficiently in advance of construction to permit sampling and testing before use.

3.4 **WATER :-**

Water shall be clean, fresh and free from organic or deleterious matter in solution or in suspension, and shall be added in such amount that may not impair the strength of concrete as specified. Water, for mixing concrete, shall be supplied by the Owner, if available at site, charged to the contractor, otherwise contractor has to make his own arrangement for the construction water requirement. For all purpose, the contractor shall arrange his own supply, storage and necessary pumping and conveyance system at contractor's expenses only, except if specifically noted.

3.5 **FORMS :-**

Shall be of wood or metal, approved by the Engineer/Architect.

3.6 **ADMIXTURES :-**

The use of admixtures is encouraged where a sound technical reason justifies it, but with the approval of the Architect/Engineer.

3.7 **WATER STOPS :-**

Water stops may be either rubber or copper. Copper water stops shall be 24 guage material.

3.8 **REINFORCEMENT :-**

Shall be according to section IV.

3.9 **EXPANSION JOINT FILLER :-**

Expansion joint filler material shall consist of formed strips of a durable resilient compound. Where stiffness is lacking in proformed expansion joint filler, the strips shall be encased in saturated felt, asphalt impregnated cotton webbing or other satisfactory material. Any material used for encasement shall be firmly sealed to the body of the joint filler and shall not become detached there-from after immersion in water for a period of 48 hours. Expansion joint filler material shall be manufactured in a workman-like manner and when 10 percent or more of any lot or shipment is of non-uniform or improper construction, the entire lot or shipment may be rejected.

4.0 **CONCRETE DESIGN MIX AND STRENGTH :-**

Unless otherwise noted on the drawings, all concrete shall be proportioned so as to obtain a twenty eight (28) days cube compressive design strength of 200 kg/cm2 at preliminary test. The grade of concrete shall be M:15 (1:2:4 approximately) / M:20 (1:$1\frac{1}{2}$:3) or as specified. The design mix shall be prepared by an established testing laboratory and submitted by the contractor to the Architect Engineer for approval before use.

5.0 **GRADING OF AGGREGATES :-**

Aggregate shall be furnished in primary sizes specified herein and shall be stored in separate batching. bins and batched as required to confirm to the combined grading requirements. The proportioning of the fine and coarse aggregate may be varied as directed by the Engineer to produce a workable mixture.

5.2 The maximum size of aggregate shall be controlled by the purpose for which the concrete is intended and in accordance with the following table.

Location	Maximum Size Coarse Aggregate

Massive Foundations	2 1/2 inch (63mm)
Typical Foundations.	1 1/2 inch (38mm)
Columns, Beams and Girders	1 inch (25mm)
Walls 8 inch (200mm) and thicker	1 1/2 inch (38mm)
Walls 6 inch (150mm) and thinner	3/4 inch (18mm)
Slab at grade thicker than 4 inch (100mm)	1 inch (25mm)
Slab at grade 4 inch (100mm) thick	3/4 inch (18mm)
Structural slabs	3/4 inch (18mm)

5.9 **GRADING AND COMPOSITION :-**

The grading of aggregates shall be as follows :

	PERCENTAGE PASSING SIEVES						
SIEVES	Primary Aggregate Size			Combined Aggregate Sizes			
	2 1/2 Inch	1 1/2 Inch	3/4 Inch Fine	2 1/2 max		1 1/2 max	3/4max
3"	100					100	
2 1/2"	90-100					95-100	
2"	35-100	100				80-85	100
1 1/2"	0-15	95-100				65-85	95-100
1"	0-10	55-85	100	50-75		50-80	100
3/4"	0- 5	35-70	90-100	45-65		45-75	90-100
3/8"		10-30	20-55	100	35-55	35-60	60-80
No.4		0-5	0-10	95-100	30-45	30-45	40-60
No.8			0-5	80-85	20-35	20-35	30-45
No.16				50-85	15-30	15-30	20-35
No.30				25-60	10-15	10-15	10-25
No.50				10-30	5-10	5-10	5-15
No.100				2-10	0-3	0-3	0-5
No.200				0 - 2	0-2	0-2	0-2

6.0 **STORAGE OF AGGREGATES :-**

Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size will be avoided and also that various sizes will not become intermixed before proportioning. Aggregate in storage shall be adequately protected from dust or other foreign matter and all aggregates, which have become coated with dust or foreign material to such an extent as the Engineer may determine, has impaired the quality of the aggregates, shall be washed or rejected as the Engineer may decide.

In placing materials in storage or moving them from storage to the mixer, any method which may cause segregation, degradation, or combining of materials of different grading, shall be discontinued and the materials so handled shall be reprocessed.

7.0 **MIXING OF CONCRETE :-**

7.1 MACHINE MIXING :

All concrete shall be mixed in batch mixers of approved type except where hand mixing is specifically approved by the Engineer. The capacity of the mixer shall be considered to be rated capacity as given in the manufacturer's catalogue, provided that a quantity equal to the rated capacity can be thoroughly mixed in the prescribed time period and further, provided there is no loss of ingredients during the mixing. Each batch shall be mixed not less than two minutes after all the ingredients are in

the mixer and until the mass is uniform and homogeneous. The mixer shall be completely discharged before being recharged. The peripheral speed of the concrete mixer drum shall be approximately 60 meter per minute.

7.2 HAND MIXING :

Where specifically approved by the Engineer, hand mixed concrete may be made in batches of not more than one cement bag and shall be mixed in a watertight mixing boat placed in a level position. The coarse aggregate shall be placed in the boat and the fine aggregate shall be sprayed on this layer, the two layers together not being more than 300 mm in depth. On this mixture shall be placed the cement and the whole mass turned not less than two times dry; then the whole mass shall be sprinkled with sufficient water evenly distributed, and again turned not less than three times or until uniform consistency is obtained.

8.0 **AMOUNT OF WATER AND SLUMP TESTS :-**

The amount of water added at the mixer shall be in accordance with the design mix and shall be regulated in accordance with the free water in the aggregates and the requirements for workability within the limits of slump test forth. The amount of water, including the free-water in the aggregates, shall not exceed 25 litres per sack of Cement. The equipment for measuring and supplying the water to the mixer shall be so constructed and arranged that the amount of water to be added to the mixture can be measured positively, and the predetermined quantity of water required can be discharged rapidly in one operation. The equipment shall be so designed that water from the source of supply cannot enter the measuring tank while the water is being discharged from the measuring tank into the mixer.

LOCATION OF CONCRETE	SLUMP
Heavy sections and foundations	2-3 inches (50mm to 75mm)
Thin sections 8" and under.	3 inches (75mm)
Slabs at grade	3-4 inches (75mm to 100mm)
Structural slabs.	3 inches (75mm)

All slumps are to be plus or minus 12mm. Slump test shall use the procedure in Appendix "G" of I.S.-456/Equivalent Slump test will be made by the contractor in presence of the Engineer/Architect.

9.0 **FORM :-**

9.1 The forms shall be smooth, true to line and grade and of sufficient strength to resist any appreciable springing out of shape during the placing of concrete. All dirt, chips, saw dust, tie wire, or other foreign matter shall be removed from the forms before any concrete is placed therein. Before concrete is deposited in the forms, all inside surfaces of the forms shall be coated with an approved form oil. The form oil shall be of high penetrating quality leaving no film on the surface of the forms that can be absorbed by the concrete.

9.2 All sharp corners above grade shall be chamfered with 1"x1" (25mm x 25mm) triangular fillets unless otherwise directed by the Engineer. The fillets or chamfer strips shall be surfaced on all sides.

9.3 Forms shall be of sufficient strength to carry the lean weight of the concrete as a liquid without any deflection, and if any deflection occurs, it shall be sufficient cause for rejection of the work. Forms for beams, girders and slabs shall be cambered such amount as may be directed by the Engineer.

9.4 Form ties shall be approved form clamps or bolts to fasten the forms. The use of twisted wire-loops to hold the forms in placing during concreting will not be allowed. Bolts or clamps shall be positive in action and shall be of sufficient strength to prevent spreading out of the forms. They shall be of such type that can be entirely removed or cut back 25mm below the concrete surface. All forms for side of members shall be constructed with stiff wales at right angle to the studs and all form clamps shall extend through and fasten such wales.

9.5 Plans of false work and centering shall be submitted to the Engineer/Architect two weeks in advance of the time, the contractor begins construction of the false work. All false work and centering shall be designed and constructed to provide the necessary rigidity and to support the loads. All false work shall be adequately braced.

9.6 The forms and false work shall not be removed or released before the concrete has obtained sufficient strength to support itself, but in no case less than the following time, shall the forms remain in place:-

LOCATIONS.	TIME
Sides of footing	24 hours
Mass footings	3 days
Columns	3 days
Walls	5 days
Sides of beams or girders	5 days
Soffits of beams or girders	21 days
Structural slabs	14 days

At time of low temperature or other adverse conditions, the Engineer may increase the setting time to 28 days.

Removal of forms shall be in such a manner as to not damage the concrete. Centering shall be removed uniformly and gradually starting at the middle of a span and working towards the support.

10.0 **CONCRETE COVERAGE OF REINFORCING :-**

The concrete coverage of reinforcing steel shall be as follows, except, as specifically noted otherwise on the drawing.

LOCATION	COVERAGE
Footing poured against earth	3 inches (75mm)
Footing poured against forms	2 inches (50mm)
Formed concrete against earth	2 inches (50mm)
Columns	2 inches (50mm)
Beams and Girders :-	
Bottom of beams	2 inches (50mm)
Sides of beams	2 inches (50mm)
Tops of beams	1 1/2 inches (38mm)
Structural Slabs :-	
Bottom	1 inch (25mm)
Tops	1 inch (25mm)

11.0 **WATERSTOPS :-**

Waterstops shall be accurately located as shown on the drawings and secured against displacement during the placing of concrete. For rubber water stops, all field splices shall be full-vulcanized, shall be bevelled at 45 degree or flatter. All finished splices shall have a tensile strength of not less than 50 percent of the un-spliced material. For copper water stops, all splices be lapped 25 mm and soldered each side of the joint to form a smooth watertight joint.

12.0 **EXPANSION JOINT FILLER :-**

Expansion joint filler shall be placed true to line and grade and shall be placed full depth of slab or width of wall. It shall be securely held in place by cementing to the oldest concrete, at the joint, with a bitumastic cement. The ends will be butted tight.

12.1 **EXPANSION JOINTS IN BUILDINGS**

Where shown, expansion joints shall be formed between the concrete faces, or between concrete and brick work or blockwork, by means of incorporating in the formwork an approved impregnated fiber-board filler to the thickness shown on the drawings.

The exposed edges of expansion joints shall be sealed as shown on the drawings. Filler boards shall be adequately wired into adjoining concrete to prevent their falling out when the joint opens.

Insitu ground floor slabs on hardcore shall be cast in bays as shown on drawings but not exceeding 140 mm in area. The layout of construction joints in the slab shall be approved in advance. The mesh reinforcement shall be so arranged that no laps shall occur along the joints.

13.0 **PLACING CONCRETE :-**

13.1 Before placing concrete, all form work, reinforcing embedded items, end etc. will be checked for completeness and location. Concrete shall be placed only upon the issue of an approved pour slip from Engineer-In-Charge/Architect.

13.2 Concrete shall be transported to the forms and shall be placed at location without segregation of its ingredients and before it has taken its initial set. Concrete shall be placed as nearly as possible in its final position. In walls, concrete shall be placed in horizontal layers, between pour joints of such depth that it may be adequately vibrated. Before concrete is placed in beams, girders, or caps of beams, columns, the concrete in the column shall have been in place at-least two hours.

13.3 With the exception of sidewalk, curbs, gutters and concrete placed on a slope at grade, all concrete shall be compacted with high speed internal vibrators of a type and size approved by the Engineer. The number of vibrators employed shall be adequate to consolidate incoming concrete within 15 minutes after it is deposited in place. In all pours there shall be at least one vibrator as standby in addition to those required for consolidation of the concrete. The location, application and duration of vibrating shall be sufficient to secure a minimum consolidation of the concrete. free of voids and a proper texture to exposed surfaces.

13.4 No concrete will be allowed to fall from a height of more than two meters without the use of adjustable length pipes or "Elephant-Trunks".

13.5 The use of chutes in conveying or placing concrete will be allowed only at the discretion of the Engineer and when used shall be laid on such.

13.6 No concrete shall be placed when the ambient temperature is 95 degree F (35 Degree Centigrade) and rising, nor when the ambient temperatures is below 50 degree F (10 Degree Centigrade) and Falling.

13.7 **TRANSPORTATION OF CONCRETE**

The concrete shall be discharged from the mixer and transported to the Works by means that shall be approved by the Employer's Representative and which shall prevent adulteration, segregation or loss of ingredients, and ensure that the concrete is of the required workability at the point and time of placing.

Mixed concrete shall not be modified by the addition of extra water or cement or otherwise, in order to facilitate handling or for any other purpose. Additives to improve workability may be added only with prior approval.

When the concrete will be carried in purpose made agitators, operating continuously, or truck mixers, the concrete shall be compacted and in its final position within 2 hours of the introduction of cement to the aggregates, unless a longer time is agreed by the Employer's Representative. The time of such introduction shall be recorded on the delivery note together with the weight of the constituents of each mix.

When truck mixed concrete is used, water shall be added under supervision either at the site or at the central batching plant as agreed by the Employer's Representative, but in no circumstances shall water be added in transit.

Unless otherwise agreed by the Employer's Representative, truck mixer units and their mixing and discharge performance shall comply with the requirements of Indian / Equivalent Standards. Mixing shall continue for the number and rate of revolutions recommended in accordance with Indian/Equivalent Standards or, in the absence of the manufacturer's instructions, mixing shall continue for not less than 100 revolutions at a rate of not less than 7 revolutions per minute.

14.0 **BONDING :-**

14.1 Construction joints shall only be located where shown on the drawings or on the contractor's approved pouring schedule. In case of emergency, construction joints shall be placed as directed by the Engineer.

14.2 Joints at stoppage of work shall be horizontal in walls and columns and in general be at the tops and bottoms of sections or stories. After the pour is completed to the construction joints, and before the concrete has taken its permanent set. the entire surface of the joint shall be thoroughly cleaned of laitance. Clean aggregate shall be exposed by wire brushing and washing with water. The joint shall be level across the section. Sloping joints will not be permitted.

14.3 Before placing new concrete against a construction joint in a wall, beam, girder or structural slabs, the joint shall be wetted and splashed with sandpaste.

15.0 **FINISHING :-**

15.1 Concrete in slabs shall be thoroughly tamped and struck to grade by a strike-board operating between the headers or screeds. It shall then be floated to a smooth surface and trowelled to raise the fines to the surface. When the concrete is firm enough to support the weight of a man, without marking the slab, it shall again be steel trowelled to a hard dense surface. Topping layers or dashing cement on the surface will not be allowed.

15.2 Non-slip finish for slabs where called for on the drawings such as at ramps, shall be made by brushing the surface with a stiff bristle broom after the first steel trowelling and in lieu of the second step trowel operated.

16.0 **CURING :-**

16.1 All concrete shall be kept wet by the continuous application of water, for a period of seven days.

16.2 Walls, beams, girders and columns may be cured by wetting the forms. In the event the forms are removed, burlap shall be used to cover the surface, and this shall be kept continuously wet.

16.3 Slabs shall be cured by applying water from a nozzle that automates the flow so that a mist and not a spray is formed, until the slab is covered by the curing medium. The moisture shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate on the surface in a quantity sufficient to cause a flow or to wash the surface. After the surface is sufficiently hard not to mark it, shall be covered with at least a 50 mm depth of sand or earth blanket. This blanket shall be continuously watered and kept saturated for a period of seven days.

17.0 **REPAIRS AND PATCHING :-**

As soon as the forms are removed from vertical surfaces all fines and projections shall be removed. All rock pockets from bolt holes and other voids shall be filled and patched. The voids shall be thoroughly cleaned, dashed with water and then filled with a mixture composed of one part cement and two parts sand by volume, and sufficient, water to make a homogenous mixture. Care shall be exercised to completely fill the void, and to obtain a perfect bond with the concrete. Where in the opinion of the Engineer the work cannot be adequately repaired, that section shall be removed and replaced at the contractor's expense.

18.0 **TEST CUBES :-**

18.1 From each pour of 25 cubic meters or as per the direction of the Engineer, cubes shall be taken. The first cube shall be broken at the age of seven days and should indicate approximately 70% of the design strength. The second cube shall be broken at the age of 28 days and should indicate the design strength, specified. If the second cube indicates the design strength, third cube shall be disposed off. If the second cube does not indicate the design strength the third cube shall be tested. If the average strength of the second and third cubes indicate a strength of 90% of the design strength, the concrete shall be assumed to meet this specification.

If the average strength of the second and third cube does not reach 90% of the design strength, the concrete shall be declared defective and shall be removed and replaced at the contractor's expense.

18.2 Before removal of the concrete under the conditions of the preceding paragraph, the contractor may elect, at his own expense, to core the section. If the section in question is eight inches (200mm) or more in thickness, two cores shall be taken, and sawed in half to give four sample cores. If the section is less than eight inches (200mm) four cores shall be taken. If the average compressive strength of the cores, adjusted for high ratio, indicate the compressive strength of the section equals 90% of the design strength, the questioned section shall then be judged to comply with these specifications and if it does not indicate an average strength of 90% of the design strength, the contractor shall then remove the defective concrete and replace it at his own expense.

18.3 Cube shall be taken in accordance with Appendix "E" of I.S. 456/Equivalent except that in all cases, rodding must be done and vibration will not be permitted.

18.4 The cost of taking and breaking the cubes shall be borne by the contractor.

19.0 **DRYPACK :-**

19.1 Dry pack shall be composed of one part cement, one and one-half parts sand and sufficient water to make a stiff paste.

19.2 Dry pack shall be placed by ramming into position with a metal ram.

19.3 Curing of dry pack shall be by covering with burlap and keeping the burlap continuously wet for 7 days.

20.0 **GROUT :-**

20.1 Plastic grout shall be composed of one part cement and one-and-one half part of sand to which shall be added 4.75 imperial gallons (22 litres) of water per sack of cement.

20.2 Flowable grout shall be composed of one part cement, one-and-one-half parts sand to which shall be added 4.75 imperial gallons (22 litres) of water per sack of cement.

20.3 Curing of grout shall be by covering with burlap and keeping the burlap continuously wet for three days.

20.4 Peak gravel may be added to the mix by direction of the Engineer.

21.0 **NON-SHRINK GROUT :-**

21.1 Plastic non-shrink grout shall be composed of one part portland cement, one part sand and one part Embeco or Cico no.3 or equivalent approved to which shall be added 3.9 imperial gallons (18 litres) of water per sack of cement.

21.2 Flowable non-shrink grout shall be composed of one part portland cement, one part sand and one part Embeco or Cico or equivalent approved to which shall be added 4.25 imperial gallons (20 litres) of water per sack of cement.

21.3 No more non-shrink grout shall be mixed than can be placed in 20 minutes. Retempering of non-shrink grout shall not be permitted.

21.4 Curing of non-shrink grout shall be by covering with burlap and keeping burlap continuously wet for three days.

21.5 Commercial non-shrink grout as marketed by various manufacturers can be allowed, after the approval to the same from the Architect Engineer, and shall be used as per the manufacturer's instructions and specifications.

Concrete shall not be placed in standing or running water unless so specified or approved.

22.0 **CONCRETE LINING FOR CANALS**

The subgrade of the canal profile shall be thoroughly wetted before placement of concrete.

23.0 **CONSTRUCTION JOINTS**

Concreting shall be carried out continuously up to construction joints, the position and arrangement of which shall be as indicated on the Drawings or as approved by the Employer's Representative.

When work has to be resumed on a surface which has set, the whole surface shall be thoroughly roughened. It shall be cleaned of all loose and foreign matter and laitance, washed with water and all free water removed immediately before placing the fresh concrete, which shall be well compacted against the joint.

24.0 SPECIAL MEASURES FOR HOT WEATHER WORKING

a) **Mixing**- In hot weather suitable means shall be provided to shield the aggregate stockpiles from the direct rays of the sun or to cool the aggregates by spraying with water and to insulate the mixing-water tank and pipelines to ensure that the temperature of the concrete when deposited shall not exceed 32°C (90°F).

b) **Placing**- In hot dry weather suitable means shall be provided to avoid premature stiffening of concrete placed in contact with hot dry surfaces. Where necessary the surfaces, including reinforcement, against which concrete is to be placed shall be shielded from the direct rays of the sun and shall be sprayed with water to prevent excessive absorption by the surfaces of water from the fresh concrete.

c) **Curing**- As per Section 16.0.

25.0 BUILDING IN PIPES, BOLTS, ETC.

Pipes and pipe specials through concrete walls and floors shall as far as possible be positioned and built in during construction. They shall be located exactly in the positions shown on the drawings and shall be true to line and level. The Contractor shall take particular care to ensure that fully compacted concrete is in contact with the pipe at all points.

Where it is impracticable to cast pipes and specials in the concrete, boxholes shall be formed in the shuttering. The box shall have six or eight sides, depending on the pipe diameter, and shall be no larger in size than will give adequate clearance for the subsequent positioning and grouting in of the pipe. The sides of the hole shall be provided with a tapered central annual recess to provide a positive key. The boxhole shall be stripped with the main shuttering and the concrete surface thoroughly cleaned and roughened.

When the pipe is later fixed, the hole shall be re-shuttered and filled with approved expanding grouting material.

Holding down bolts shall be fitted with expanded metal cones, positioned and built in during construction. The bolts shall be fixed in the precise position using an approved expanding grouting material.

26.0 PRECAST CONCRETE

26.1 Precast concrete - general

Precast concrete shall comply with Sections III of this specification. The concrete grade requirements will be as shown on the Drawings.

Precast concrete shall be cast in properly made strong molds to form shapes required. For work described as "fairface" the mould shall be lined with sheet metal or other approved material.

Surfaces against which insitu concrete mortar or grout is to be placed, shall be prepared as soon as possible after casting by spraying with a fine water spray or brushing with a stiff brush, just sufficient to remove the other mortar skins and expose the large aggregate without disturbing it.

Lifting links, pockets or sockets that may be considered necessary for erection shall be subjected to prior approval and shall be so constructed and positioned as to be invisible after construction is complete.

Precast concrete shall be concrete Class 25 as described and shall be thoroughly compacted by vibration in the molds and shall not be removed from them until seven days after placing the concrete. The sides may be removed after three days provided that the molds are such that the sides are easily removable without damaging the concrete.

The precast work shall be cast under sheds and shall remain there for seven days in the molds and a further seven days after removal from the molds. During the whole of this period the concrete shall be shielded by sacking or other approved material kept wet. It shall then be removed from the sheds and stacked in the open for at least seven days to season.

Precast work shall be cast in lengths convenient for handling unless otherwise required. The precast units shall have adequate strength to resist overstressing and damage during handling and erection. Care shall be taken to ensure that the units are not chipped or damaged.

26.2 Testing of precast concrete units

Load testing to destruction shall be carried out in 1% of all precast units. Units for routine testing shall be taken at random and those units destroyed shall be immediately replaced.

26.3 Erection of precast units

Precast units shall be hoisted and placed in proper position in such a way as to avoid overstressing or damaging the units or causing damage to previously erected structure. Where shown, the units shall be laid on a thin bed of cement in order to even out irregularities of supporting members.

Steps necessary, such as taping of joints shall be taken to prevent escape of grout which lead to staining of brick and block works and exposed concrete surfaces when the insitu topping is laid.

Precast members shall be held rigidly in position during placing of insitu concrete.

26.4 Holes in precast units

Examine architectural, structural and services drawings to determine dimension and location of holes.

Permission to form holes in precast units after casting shall not normally be given, but in exceptional cases where the structural soundness of the perforated unit and its visual acceptability is satisfactory such permission may be given in writing.

26.5 Marking

Precast units shall be clearly marked after casting or demoulding, showing the identification of the unit and, if necessary, erection instructions. The marking is to be such as to be invisible after erection.

26.6 Samples

Samples of precast units, before fabrication in bulk specimen samples of the precast units shall be submitted for approval, with which further deliveries or casting shall be compared for uniformity of color and finish.

CONSTRUCTION SPECIFICATION
FOR
REINFORCING STEEL

SECTION - IV

1.0 **SCOPE :-**

The work covered by this specification includes furnishing all labour, material and equipment and performing the operation necessary to complete the reinforcing work for concrete and masonry shown on the approved drawings and specified herein. If demanded by the Engineer, the contractor shall produce manufacturer's test certificate for steel procured and proposed to be put in the work.

2.0 **APPLICABLE PUBLICATION :-**

All work shall be in accordance with the latest revision of the Indian/Equivalent standards except where specifically noted otherwise.

Tor steel	I.S. 1786
Reinforcing steel	I.S. 432
Welded steel wire Fabric	A. S. T. M. A. 185, I.S. 1566
Fixing of Reinforcement	I.S. 2502

3.0 **MATERIALS :-**

3.1 Reinforcing shall be made from new billet steel conforming to I.S. 432/Equivalent, of tested quality, No re-rolled material shall be allowed.

3.2 Welded steel wire fabric shall conform to A.S.T.M.A. 185 or I.S. 1566/Equivalent and shall have gauge of wire and dimensions of mesh shown on the drawings.

3.3 Reinforcing tie wire shall be annealed wire of 14 or 16 gauge.

3.4 Cold work deformed bars conforming to I.S. 1786 /Equivalent and hot rolled variety conforming to I.S. 1139./Equivalent.

4.0 **STEEL LISTS AND PLACING DIAGRAMS :-**

Two copies of all reinforcing lists and placing diagrams shall be furnished to the Engineer before any fabrication of reinforcing is done. The list and diagram will be reviewed for design only and one corrected or approved copy will be returned to the contractor.

5.0 **CLEANING :-**

Reinforcing steel, before being placed in the forms, shall be thoroughly cleaned of scale and rust, mortar, oil, dirt or coatings of any character that would destroy or reduce bond, and it shall be maintained in this condition until the concrete is placed.

6.0 **BENDING :-**

Reinforcing steel shall not be bent or straightened in a manner that will injure the material. Bars with bends or kinks not shown on the drawings shall not be used. Bends for stirrups and ties shall be made around a pin having a diameter of not less than two times the thickness of the bar. Bends for other

bars, shall be made around a pin having a diameter larger than 25 mm where the pin shall not be less than eight times the bar diameter. All bars shall be bent cold.

7.0 **PLACING :-**

7.1 Reinforcing steel shall be accurately placed and secured and shall be supported by chair, spacers, or hangers. Reinforcing steel shall be securely held in position by wiring at inter-sections with annealed wire of 14 or 16 gauge. Placing bars on fresh concrete as the work progresses and adjusting bars during the placing of concrete will not be permitted.

7.2 The minimum clear distance between parallel bars, except in columns, shall be either the diameter of the bar, 25 mm or one and one third times the maximum coarse aggregate whichever is greater.

7.3 Cover of concrete over reinforcing steel shall be as specified in concrete section III.

7.4 All dowels shall be accurately placed with a lap length of 40 bar diameter extending across the joints.

7.5 Vertical reinforcing for masonry shall be held in place with a frame like device until the masonry is in place. Horizontal reinforcing may be placed as the masonry progresses.

7.6 Welded steel - fabric shall be rolled flat before placing concrete. Wire fabric shall be positioned and held against vertical or horizontal movement by devices satisfactorily to the Engineer. If during placing it is found that the mesh is being displaced, the contractor shall provide means of pulling mesh into the proper position while the concrete is being placed. Polythene covers or suitable covers available in the market shall be used.

7.7 Splices in reinforcement in slabs, beams, girders, shall not be made, at points of maximum stress, unless so detailed, or without permission of the Engineer. Splices where permitted shall be lapped a sufficient length so as to develop the bar in bond but not less than 40 bar diameter. In such splices the bars shall be wired together.

7.8 Splices in reinforcement in columns where change in column cross section occurs shall be spliced in a region where lateral support is afforded. Where off-set, the slope of the inclined portion of the bars shall not be more than one in six, and in tied columns the ties shall be spaced at 75mm on centre for a distance of 30cm below the actual point of offset.

7.9 Splices in welded steel wire fabric shall be by lapping one mesh length.

7.10 The test reports of the various lots supplied at site, as directed by the Engineer at site, shall be obtained from time to time, after getting the sample tested from the approved laboratory as directed by the Engineer, at the cost of the contractor.

CONSTRUCTION SPECIFICATION
FOR
STRUCTURAL STEEL

SECTION V

1.0 **SCOPE**:-

The work covered by this specification includes furnishing all labour, materials, equipment and performing the operations necessary to complete the structural steel work shown on the approved drawings and specified herein.

The contractor has to prepare the shop drawing from the structural drawing and the shop drawing shall be got approved prior taking up the Fabrication work from the Architect Engineer.

2.0 **APPLICABLE PUBLICATIONS** :-

All work shall be in accordance with the latest revision of the Indian/Equivalent Standards except where specifically noted otherwise.

Structural Steel	I.S. 800, I.S. 226
Structural Safety	I.S. 806 & 1161
Structural Safety	I.S. 875

3.0 **WORK NOT INCLUDED** :-

1) Reinforcing Steel
2) Miscellaneous Metals.

4.0 **MATERIALS** :-

All materials shall be new and tested quality, Necessary test certificate from manufactures, from whom materials are procured shall conform to the following :-

4.1 Structural steel shall conform to I.S. 226 /Equivalent and shall be of tested quality.

4.2 Rivets shall conform to I.S. 1148./Equivalent.

4.3 Welding electrodes shall conform to I.S. 814/Equivalent.

4.3.1 Electrodes for general welding shall be I.S. Code M 317443./Equivalent.

4.3.2 Low Hydrogen Electrodes shall be I.S. Code M 615499 /Equivalent. All low Hydrogen electrodes shall be delivered in hermetically sealed containers until used and after the containers are opened, shall be maintained at a minimum moisture-content in an oven.

4.4 All bolts and nuts shall conform to I.S. 1608./Equivalent.

4.5 Washers shall conform to I.S. 226./Equivalent.

4.6 Structural Tubes shall be yst 22 grade finished welded and tested quality with minimum wall thickness of 3.25 mm unless otherwise mentioned and shall conform to I.S. 806 and I.S. 1161/Equivalent.

4.7 PAINT :-

4.7.1 Shop coat shall be one coat Red lead and oil or Zinc chromate Noble Chrome Prime or equal, GHD shall confirm to I.S. 2074/Equivalent.

4.7.2 Field coat except as noted shall be two coats of Noble Iron coat or equal.

4.7.3 Acid Resistant paints shall be Noble chlorcote or equal.

5.0 **FABRICATION AND SHOP ASSEMBLY** :-

5.1 Before being fabricated or worked in any manner, all material shall be straightened, by method which do not damage the steel, and all rust and scale shall be removed. After working, all twists or bends shall be removed before parts are assembled.

5.2 All members and section shall be closely fitted and finished true to line.

5.3 Joints between columns and base or cap plates shall have the contact faces milled to a true surface and shall be rigidly held in position while fastening together.

5.4 All necessary accessories such as fixtures, fittings, connections, shall confirm to the relevant specifications of I.S. 730/Equivalent.

6.0 **WELDING** :-

All welding shall be done by the Electric Arc welding process, and shall confirm to I.S. 816./Equivalent.

7.0 **RIVETING** :-

All riveted members shall be accurately held in place during the riveting operation. All rivets shall be properly heated and when driven shall completely fill the hole. Drifting of un-fare holes will not be permitted.

8.0 **BOLTING** :-

All bolted members shall be accurately held in place during the bolting operation. Drifting of unfair holes will not be permitted. On sloped connections bevel washer shall be used to ensure satisfactory bearing under bolt heads and nuts.

9.0 **ERECTION** :-

9.1 All members shall be erected plumb, square and true to the line and grade and in the precise position as indicated. Temporary guys, shores and bracings shall be installed where necessary and shall be capable of sustaining all loads which occur during erection. Temporary guys, shores and bracings shall remain in place as long as necessary to safeguard the structure.

9.2 As erection progresses, the work shall be bolted up as required to maintain the structure in proper position during erection and to sustain all loads during erection. After the structure is properly aligned, plumbed and leveled, all field connections shall be made.

9.3 Each column base plate shall be accurately set with proper alignment and shall be plumbed at the proper height. The base plate shall be held accurately in position with either leveling nuts or steel shims. Except as specifically called for, leveling plates will not be permitted.

9.4 The erection of all members shall be carried out in proper sequence with the work of other trades, and shall be anchored to other materials in conformance with the details.

10.0 **PAINTING**:-

10.1 After fabrication all steel shall be thoroughly cleaned of scale, grease, oil, dirt or other foreign matter and all surfaces, except those to be embedded in concrete or masonry, shall be given a shop coat of the specified primer to a dried thickness of 0.06 mm. The paint shall not be applied until all surfaces to be covered are clean and thoroughly dry. It shall be worked into all joints and angles and shall cover all surfaces. This coat shall be completely dry before being loaded for delivery.

10.2 After erection, all field connections, and abrasions shall be cleaned and given a touch-up coat of primer and the either work shall be left in a neat and acceptable condition to receive the field coat of paint.

10.3 After the touch-up coat is thoroughly dry and all surfaces are clean, the field coats shall be applied to all surface not encased in concrete or masonry. Each field coat shall have a dried coat thickness of 0.05mm.

10.4 Colours of field coat will be selected from standard Manufacturer's colours, and shall be approved by the Architect.

11.0 **FENCING**

11.1 REFERENCES

In this section reference is made to the relevant Indian/Equivalent standards:

Manual of cold formed welded structural and furniture steel and tubing for gates and gate posts.

11.2 SUBMITTALS

Manufacturer's brochures and other literature giving a complete description of materials for fences and gates to be used shall be submitted for approval.

11.3 MATERIALS

Materials for fencing and gates shall conform to the following requirements:

(a) Chain link intermediate and straining T posts shall conform to the requirements of I.S./Equivalent.

(b) Gate posts and frames shall conform to the Indian / Equivalent Standards.

(c) Bracing bars shall conform to the requirements of I.S./Equivalent.

(d) Concrete for fencing and gate posts shall be Grade 10 concrete as described in Section III.

Fencing shall be galvanized steel with a thickness of 2.5 mm. The mesh shall be diamond shaped with 50 x 50 mm opening to the center of wires.

Fence posts and strainers shall be 35 x 35 x 3 mm mild steel Tee profiles or as per drawing.

Fence bracing shall be 12 mm mild steel reinforcing bars or as per drawing.

Gates shall be RHS expanded metal as detailed on Drawings.

Tying wires for chain-link fencing shall be 2 mm thick mild galvanized steel wires.

11.4 FABRICATION

Fence posts, strainers, gate posts and gates shall be fabricated in accordance with the detailed drawings.

Welding for gates and posts and bracings to fence posts shall be in accordance with the requirements in Structural Steel.

Welded joints on gates and gate posts shall be neatly made, filed smooth and left clean.

Gate and gate posts shall be primed at shop and painted after installation as specified in Anti-Corrosion Measures.

11.5 INSTALLATION

Fencing shall be installed in accordance with the details shown on Drawings.

Intermediate, strainer and gate posts shall be fully embedded in concrete as shown on Drawings.

Chain link fences shall be securely tied to fence posts bracings using tie wires. The holes in the posts for tying shall be spaced at a maximum distance of 100 mm. or as per drawings.

Bracing bars shall be securely welded to posts and strainers.

Fence posts, strainers and bracings shall receive one coat of primer preceding the installation of chain link fence.

12.0 EXECUTION

(a) INSPECTION: The Employer's Representative shall examine the areas and conditions under which miscellaneous metal items are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptance to the Employer's Representative.

(b) PREPARATION: Furnish setting drawings, diagrams, templates, instructions and directions for the installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having

integral anchors, which are to be embedded in concrete or masonry construction. Coordinate the delivery of such items to the project site.

(c) INSTALLATION:

(i) FASTENING TO IN-PLACE CONSTRUCTION: provide anchorage devices and fasteners for securing miscellaneous metal items to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connector as required.

(ii) CUTTING, FITTING AND PLACEMENT: perform cutting, drilling and fitting required for the installation of the miscellaneous metal items. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

(iii) FIT EXPOSED CONNECTIONS accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

(iv) FIELD WELDING: Comply with BS.4870, 4871, 4872, 5135 for the procedures of manual shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

(v) TOUCH-UP PAINTING: Immediately after erection, clean fields welds, bolted connections, and abraded areas of the shop paint, and paint all exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 0.05 mm.

(d) Metallic Coatings

Parts to be galvanized shall be properly prepared and galvanized in accordance with I.S./Equivalent Safeguards against possible embrittlement of steel products shall be in accordance with I.S. /Equivalent Galvanized surfaces shall be supplied free from damage.

(e) Repair of Paint Film

The Contractor shall provide paint of compatible material and color to repair any shop paint film which has been damaged during transit.

If the base metal has deteriorated due to the damaged protective coat, the affected area and the immediate surrounding area for a distance of 50 mm shall be cleaned and repainted in accordance with the original specification.

Sufficient paint for the repair of shop coating shall be delivered in containers sealed by the manufacturer and the capacity of the containers for single pack paints shall not exceed 5 liters.

13.0 Testing and Inspection

(a) Testing

(i) The Employer may appoint a testing consulting laboratory to carry out testing and inspection as required by the Employer's Representative to ensure conformance with the design and specifications.

(ii) The Contractor shall assist the testing laboratory by making access to fabrication facilities and erected sections.

(iii) Shop welding shall be tested by the Employer's Representative's inspector at the factory at the Employer's Representative's option. If testing is required by the Employer's Representative no item shall leave the shop until approved by the testing laboratory.

(b) Inspection or Test Failure

(i) In the event of failure of the product or any part to fully meet any inspection or test requirements specified herein, the Contractor shall notify the Employer's Representative should he wish to repair and/or use such product or part. At the discretion of the Employer's Representative, suitable repairs and re-inspection and retesting may be carried out.

(ii) If the repairs, including redesign, are likely to affect the results of the tests or work previously completed, appropriate re-inspection and retesting shall be conducted.

(c) Test Reports

(i) Within thirty days of completion of each and every test required, as proof of compliance with the Specification and/or each and every specified test, including commissioning tests, the Contractor shall submit to the Employer's Representative 6 signed copies of a report covering such tests.

(ii) The test records for materials shall identify the component parts in which the materials are to be used and the certificate shall be prepared in such a way that it can be easily determined if the applicable Specification or standard has been complied with.

(d) Field Testing

The Employer reserves the right to make any laboratory and/or field tests to determine whether or not any item supplied meets the requirements of this Specification.

14.0 Structural Steel and Miscellaneous Structural Requirements

(a) In accordance with the general requirements of Annex 13 Submissions, the following shall be submitted for review and approval:

(i) Shops drawings, sketches with complete fabrication and installation details
(ii) Samples
(iii) Mill tests
(iv) Torque wrench calibration equipment
(v) Paint specification and manufacturer
(vi) Welders qualifications
(vii) Maintenance recommendations
(viii) Manufacturers' catalogue data sheets
(ix) As built of any changes from the Employer's Representative's drawings
(x) Erection procedures

(b) Materials

(i) Structural steel for buildings, including rolled shapes bars and plates shall comply with the requirements of I.S./Equivalent.

(ii) Nuts and bolts I.S. /Equivalent regular series hexagon head and nuts.

(iii) Shear connectors shall be of sizes as shown on drawings and welded in accordance with I.S. codes./Equivalent.

(iv) Shop painting shall be of red lead iron oxide linseed oil primer.

(c) Cutting, Sawing and Drilling

Plates and sections shall be true to form. Stiffeners, plates and the like shall be ground to fit the profile of the member. Sections to be cut to 'exact' lengths shall be accurately cold sawn or machined. Preparation of edges by flame cutting shall, wherever practicable, be done by machine. Cold sawn, machine-cut and flame-cut edges shall be cleaned free of burrs and slag and left as smooth and regular as those produced by edge planning.

(d) Check Plate

Check plate flooring shall be 'Durbar' non-slip raised pattern or other equal approved. Individual plates shall be cut and fitted so that the pattern on adjacent panels matches in all directions.

Unless otherwise stated, the plate shall be 8 mm thick on plain and shall be fastened to the steelwork by 10 mm counter-sunk set screws at a pitch not exceeding 500 mm centers.

Kicking strips not less than 100 mm high shall be provided at the edges of all platforms and doors.

(e) Steel Grating

Steel grating 40 mm thick, of a non-slip all welded type shall be supplied and supported as indicated on the drawings.

(f) Crane Rails

Sizes and location shown on the drawings. Joints shall be staggered on opposite sides. Manufacture in accordance with I.S./Equivalent for Crane Rails.

(g) Galvanized Steel Railings

40 mm inside diameter standard steel pipe handrail. Brackets not to exceed 1.5 m on center. All joints and corners to be smooth. Bends in handrailing shall be carefully formed to give satisfactory continuity of curvature and alignment and rails shall be jointed with a flush scarf joint held together by means of a tapered pin or other approved joint.

(h) Steel Stairs

The treads and landings of stairways shall be check plate or similar. The treads shall have double nosing bar to emphasize the leading edge of the tread, or other equal approved. All treads in a flight shall match one with another and also with the line pattern of the landings and, where possible, with the floors served by the stairs.

Unless otherwise specified the widths of landings shall be 1,000 mm and the width between staircase stringers 760 mm minimum. The inclination of stair stringers to the horizontal shall not exceed 42 degrees. Kicking strips not less than 100 mm high shall be provided at the edges of all landings.

(i) Insulated Roof Cladding

Steel roof cladding shall conform with the structural steel layout. Insulated roof cladding shall be 0.5 mm minimum thick with a "U" value of 0.10 (minimum). All roof cladding material shall be hot dip galvanized.

(j) Steel Cladding

Steel sheet cladding shall conform with the structural steel layout, 0.5 mm thick. All sheeting material shall be hot dip galvanized unless otherwise specified.

(k) Chain Link Netting

The chain link netting surrounding the fermentation section of the ethanol plant shall be hot dip, galvanized and supplied in sections to facilitate removal.

(l) Holding Down Bolts

Bolts shall be I.S. /Equivalent regular series hexagon head and nuts.

(m) Ventilators

The ventilators shall be 26 gauge galvanizing steel / aluminium mounted ridge and/or of the gravity type. Ventilators shall not permit entry of insects or birds into the building.

(n) Metal Ladders

Ladders shall be as detailed with single rungs, shouldered at each end, and inserted into prepared holes in the stringers and welded. The pitch of additional rungs to bridge the gap between the top rung of ladders and edges of platforms shall not exceed 57 mm. The stringers shall open out at the top of the ladder to allow adequate room for the user to turn to face the ladder when descending and the stringers shall extend a minimum of 1,060 mm above the level of the platform. Where necessary the stringers shall be bent over to form a continuous connection with the platform handrailing and at the same height as the top rail. As required by the Code or Engineer, ladders shall be provided with safety hoops. Stringers shall be attached to the adjacent structure by suitable cleats which shall be firmly attached to the stringers and the supporting structure and be sufficiently close together to make the ladder rigid throughout its length.

The cleats shall be of sufficient length to give the required clearance at the back of the ladder. The top rung of a ladder shall be at the same level as the floor or edge of the platform unless the flooring of the platform has been extended to form the top rung and there shall be no obstructions above this level.

(o) Metal Flashing

The metal flashing shall be of 26 gauge galvanized steel and formed to the required profile.

(p) Light Panels (Translucent Sheets) :-

Translucent sheeting shall comply with I.S./Equivalent and shall be continuous and of thermosetting polyester synthetic resin.

The sheeting shall be coated to prevent attack by ultra violet light. Light transmission shall be at least 75%.

It shall be graded AA when tested to I.S. /Equivalent and shall have a Class 1 surface spread of flame.

(q) Louvers

Louvers shall be of galvanized steel designed as an integral part of the cladding system. They shall be fixed type louvers.

(r) Windows

The windows shall be of the sash type, manually operated, factory glazed and designed as an integral part of the cladding system, or to be inserted in masonry walls.

(s) Sliding Doors

The doors shall be of galvanized steel designed as an integral part of the wall cladding system. They shall be fabricated from rolled steel sections, faced externally with galvanized steel sheeting and painted. The doors shall have overhead tracks, floor guides, galvanized weatherhoods and suitable locks and handles.

(t) Gutters

The gutters shall be fabricated of 26-gauge galvanized steel designed with a contour fitting the general configuration of the buildings.

(u) Downspouts

The downspouts shall be of 26-gauge galvanized or as specified.

(v) Bearing Splices

Fastening of bearing splices of compression members shall be done after the abutting surfaces have been brought completely into contact. Bearing surfaces and surfaces that will be in permanent contact shall be clean prior to final assembly of members.

(w) Bolted Joints

All bolted connections shall be in accordance with I.S./Equivalent.

Structural steel bolts, nuts, studs and washers shall comply with I.S./Equivalent.

High strength friction grip bolts shall comply with I.S./Equivalent and shall be used in accordance with I.S./Equivalent.

(x) Lining and Plumbing Tolerances

The tolerances within which the final position of the steelwork will be accepted shall be as follows:

Permissible Deviation

Linear Dimension (in plan):

Up to and including 8 m +/- 10 mm
Over 8 m up to and including 15 m +/- 15 mm
Over 15 m up to and including 25 m +/- 20 mm
Over 25 m +/- 20 mm

Plumb:

In 30 m height +/- 15 mm

Levels:

Plumb distance between designed and actual level of the base of the first column to be erected +/- 5 mm

Plumb distance between designed and actual level of any beam at its junction with a column (in any 30 m length) +/- 15 mm

Plumb distance between designed and actual levels of the upper and lower surfaces of two or more beams meeting at a column +/- 5 mm

(y) Qualification and Testing of Welders

The Contractor shall satisfy the Employer's Representative that welding operators are suitable for the work upon which they will be employed. Welders shall provide evidence to the satisfaction of the Employer's Representative that they are capable of passing the tests as specified in I.S. /Equivalent.

(z) Crane Runways

Crane runways shall be erected complete with all columns, girders, beams, bracing, crane rails, crane stops, and other required components as indicated. The gauge, alignment and elevation of crane rails shall be accurate to a tolerance of plus or minus 3 mm. Crane rails joints shall be staggered with respect to each other on opposite sides of the runway and shall not coincide with the crane girder joints. The top of the crane rails shall be flush at all joints.

(aa) Non-Destructive Testing of Welds

Weld quality and correct standards shall be in accordance with I.S/Equivalent, as modified herein. The Contractor shall furnish facilities for performing the tests, including power and utilities, at no additional cost to the Employer at the expense of the Contractor.

(i) Radiographic testing shall be in accordance with I.S/Equivalent. The welder or welding operator's identification mark shall be stamped on the steel as specified so that full and complete identity and history of the welding operation will be known.

(ii) Correction of Defective Welds. Weld areas containing defects exceeding the standards of acceptance in the above I.S./Equivalent, revealed by radiography shall be repaired under the direction of the Employer's Representative, and additional radiographs of the repaired areas shall be made at the Contractor's expense, 100 percent radiographic inspection of that welder's work will be required at the Contractor's expense.

(iii) Ultrasonic Inspection. Technique and standards of acceptance shall be in accordance with I.S/Equivalent.

(iv) Magnetic Particle Inspection methods shall be in accordance withI.S./Equivalent.

(v) Liquid Penetrant Inspection methods shall be in accordance with I.S./Equivalent.

(bb) High-Strength Bolted Connections

Certification shall be furnished that installation is in accordance with Indian or British Standards. The procedure for calibration of wrenches and installation of bolts shall be submitted to the Employer's Representative for approval thereof.

CONSTRUCTION SPECIFICATION
FOR
MASONRY CONSTRUCTION

SECTION VI

1.0 **SCOPE:-**

The work covered by this specification includes furnishing all labour, materials, equipment and performing the operations necessary to complete the masonry work shown on the approved drawing and specified herein.

2.0 **APPLICABLE PUBLICATIONS :-**

All work shall be in accordance with the latest revision of the Indian/Equivalent Standards except where specifically noted otherwise.

Cement	I.S.	269
Sand	I.S.	383
Lime	I.S.	712
Stone	I.S.	1127
Brick	I.S.	1077
Concrete Block	I.S.	2185
	I.S.	1725

3.0 **MATERIAL :-**

3.1 Cement :-

Shall be ordinary portland Cement conforming to I.S. 269 /Equivalent. All cement used shall be suitably protected from exposure to moisture until used.

3.2 Sand shall consist of approved natural sand, manufactured sand or a combination of both and shall be hard and durable. It shall be free from organic matter or other deleterious material. Adequate supplies of sand shall be stockpiled sufficiently in advance of construction to permit sampling and testing before use. Sand shall conform to the following sieve analysis.

Sieve	Percentage Passing
10mm	100
No. 4 (4760 Micron)	95-100
No. 8 (2380 Micron)	80-100
No. 16 (1190 Micron)	50- 85
No. 30 (590 Micron)	25-60
No. 50 (297 Micron)	10-30
No. 100 (149 Micron)	2-10

With not more than 45% retained between any two consecutive sieves. The fineness modulus shall be between 2.25 and 2.75

3.3 Lime Putty :-

Shall be made from quicklime or Hydrated lime and shall weigh not less than eighty-fourty eight kg.per cubic meter. After slacking, screening and before using, it shall be stored for ten days.

3.4 Stone :-

Shall be natural stone and shall be sound, clean, hard, durable and free from seams or other imperfections, and free from skins form. No weathered stones will be accepted.

3.5 Brick :-

Shall be hard burned clay bricks and at the time of laying shall have a rate of absorption of not more than 4.60 gms. of water per square cm. of surface submerged to 3 mm. of water for one minute.

3.6 Reinforcement :-

Shall be according to section IV.

4.0 **MORTAR AND GROUT :-**

4.1 Mortar :-

Shall be composed of one part cement, one part lime putty, four and one-half parts sand, and sufficient water to make a plastic mix or as specified on drawing and schedule of quantity.

4.2 Grout :-

Shall be composed of one part cement, two part sand, and sufficient water to allow the grout to flow into all joints and interstices of the masonry.

4.3 Mixing :-

Shall be done either in a mechanical mixer or in a mixing pot. The sand, cement and water shall be placed in the mixer, in that order, for each batch of mortar or grout and shall be mixed for a period of at least two minutes, and the mixing continued as long as need to secure a uniform mass, but in no case less than two minutes. Equipment for mixing and handling shall be approved by the Engineer. Re-tempering of mortar shall be done only by adding water into basic made with mortar, and the mortar carefully worked into it. Re-tempering by dashing water over the mortar will not be permitted. Any mortar or grout unused within one hour after the initial mixing shall be removed from the work. Mortar shall be mixed and maintained while being used to a slump of 5.08 cm. & 1.27 cm. to 10 cm. using a truncated cone 100mm or 50mm, 150mm high, and grout should have a slump of 12.7cm. to & 1.27 cm.

4.4 Mortar compressive strength shall be not less than 52 kg. per square cm. at seven days nor less than 105 kg. per square cm. at twenty-eight days.

4.5 Grout compressive strength shall be not less than 70.3 kg per square cm. at seven days nor less than 104.61 kg. per square cm. at twenty-eight days.

5.0 **STONE CONSTRUCTION:-**

5.1 Wetting of stones :

All stones shall be thoroughly wetted before placing in position.

5.2 Laying of stones :

The walls shall be carried up truly plumb. Every stone shall be carefully fitted to the adjacent stones, so as to form neat and close joints, stone may be laid at random without being brought up to any level courses except at plinth, window sills, bond beams and roof level. The bond shall be obtained by filling in closely the adjacent stones and by using two bond stones for every 1 Sq. meter of wall surface and staggered. Through bond stone shall run right through thickness of wall. The stone shall be laid on its natural quarry bed.

Face stone shall extend and bond well into the backing. These shall be arranged to break joints as much as possible, and to avoid long vertical joints. Their heights shall not be greater than the breadth at the face or the depth inwards.

The hearting or interior filling of the wall face shall consist of rubble stone not less than 13 cm in any direction. The hearting will be laid nearly level with facing and backing except that at about one meter intervals, vertical "Plumbs" projecting about 15 to 20 cm. shall be firmly embedded to form a bond between successive courses. The use of chips shall be restricted to the filling of interstices between the adjacent stones in hearting and these shall not exceed 15% of the quantity of stone masonry. Selected stones roughly squared to line shall be placed at all wall angles, corners and ends. Flat or stratified stones shall be laid in a horizontal and not on edge.

Joints in face of the wall shall be not less than 12mm. nor more than 25mm. in thickness. Interior spaces between stones shall be filled with mortar. No voids will be permitted in any part of the wall.

5.3 Pointing :

Within 24 hours after construction, the joints on all exposed wall faces shall be racked clear of loose mortar, to a depth of not less than 20mm and pointed with the mortar specified, so that all joints are recessed a minimum of 6mm.

5.4 Curing :

All masonry shall be kept continuously damp for a period of seven days after laying by either fog spraying or by covering all surfaces with burlap and wetting this burlap.

6.0 **BRICK CONSTRUCTION :-**

6.1 All bricks shall be wetted thoroughly so that at the time of laying, the bricks will have a residual rate of absorption of between 5 and 15 per cent.

6.2 Laying of Brick :

All Bricks shall be laid true to line and grade, level and plumb in a full bed joint, with a full shoved head joint set in English bond. Firrowing of mortar will not be allowed.

Horizontal concrete surfaces which are to receive brick work shall be damp, clean and free of laitance. In reinforced grouted masonry, the vertical reinforcing shall be in place before the masonry work begins. The first course on each side of the wall shall be laid and then 40mm. of grout shall be placed between the bricks.

The bricks shall then be laid so that not more than three bricks in height are laid on one side of the wall before one course is laid on the opposite and the grout space is then filled. This procedure shall be followed throughout so that at no time is one way more than three bricks high than the other, and at no time is the top of the grout more than 40mm. below the top of the brick in the lower whythe. Mortar shall not project into grout space on head or bed joints.

Grout shall be placed as the work progresses and shall be poured from the inside face of wall. Grout shall be well puddled with a stick, slicing with a trowel will not be permitted.

6.3 Tooling of joints :

Except for walls to be plastered, all joints shall be tooled with a round tool of 2mm. diameter in such a way as to squeeze the mortar into the joints and fill all pinholes in the mortar. Joints in wall to be plastered shall be struck flush.

6.4 Curing :

Curing shall be according to paragraph 5.4 of the specification.

7.0 **CLEANING :-**

On the completion of the masonry work, all surfaces which are to be exposed in the final condition are to be cleaned, removing all mortar, grout and stains from the exposed faces.

8.0 **MASONRY TO BE PLASTERED :**

All surfaces to be plastered shall be thoroughly wet down 48 hours and then again 24 hours before plastering operation begins. The surface must be clean and free from dirt, oil, paint, or other material which may reduce bond.

9.0 **MASONRY TO BE PAINTED :-**

All surfaces to be painted shall be thoroughly dry and in no case paint be applied until two months have elapsed after the completion of masonry or two months after the monsoon season.

10.0 **CLEANING-UP :-**

At the completion of the masonry work, the contractor shall remove all scaffolding, equipment, debris and surplus material from the site and dispose of all debris as directed.

11.0 **BRICKWORK AND MASONRY**

11.1 CONCRETE BLOCK WALLS

(a) Concrete block walls shall be built with new hollow concrete blocks laid and bonded with mortar.

(b) All units shall be laid with full mortar coverage of the face shells in both horizontal and vertical joints. Units shall be lapped in successive vertical courses.

(c) Wall surfaces shall be plumb and straight. Wall thickness shall be as shown on the Drawings.

(d) Concrete blocks shall comply with I.S. Class A/Equivalent. They shall be obtained from an approved supplier or may be manufactured on Site. Samples shall be submitted to the Employer's Representative and his approval must be obtained before any blocks are delivered or used in the construction of the Works.

For blocks manufactured on Site, the Contractor shall prepare a design mix using the materials available to him to give a minimum average compressive strength of 2.8 N/mm^2 on gross area after 28 days from casting. A minimum of six blocks shall be prepared from this mix for testing.

Samples of blocks from each subsequent batch (minimum number six) shall be submitted to the Employer's Representative for testing to ensure that the prescribed standards are maintained and when blocks are manufactured on Site, the Contractor shall mark each day's output with the date of manufacture for identification.

Materials for the blocks shall not contain any impurities which will affect the strength for durability of the blocks or the durability and appearance of any applied finishes.

Blocks shall be uniform in texture, shape and size, with sharp arises and free from any cracks or defects. Curing shall be carried out for at least seven days under moist coverings. All manufacture and curing shall take place on a suitable smooth concrete floor and only machines of approved design may be used for manufacture. The surface characteristics of the blocks shall be such that a good key for rendering or plastering, is provided where required.

(e) Portland cement shall conform with the latest specifications of the Indian / Equivalent Standard I.S./Equivalent.

(f) Sand shall comply with I.S/Equivalent.

(g) Lime shall be hydrated lime and shall comply with I.S/Equivalent.

(h) Water shall be as that specified in other Sections.

(i) Block walls shall have concrete tie columns at corners, ends of free standing walls, at sides of wall openings exceeding two meters and at two meters on centers.

(j) Tie columns shall be 200 mm wide by 300 mm long, reinforced with four vertical bars 14 mm diameter and ties 8 mm diameter spaced 300 mm on centers.

(k) Block walls shall be capped at top of wall with a tie beam and reinforced with intermediate tie beams vertically spaced two meters on centers.

(l) Concrete tie beams shall be 200 mm wide by 300 mm high reinforced with four bars 16 mm diameter (two top and two bottom).

(m) Blocks shall be properly stacked on level hardstanding and be adequately protected from inclement weather.

Cements and limes shall be stored in dry, watertight sheds or stores and in such a manner to enable them to be used in rotation, in order of delivery.

Sands shall be stored separately, according to type, on clean, dry, hardstanding and protected from contamination.

12.0 DAMP PROOF COURSES

Damp-proofing for horizontal application shall be hessian based bituminous felt conforming to I.S./Equivalent Damp-proofing for vertical application shall be high melting point bitumen of approved manufacture.

13.0 MASTIC POINTING

Joints and surfaces to receive mastic shall be properly cleaned and primed as required and the mastics mixed and applied strictly in accordance with the manufacturer's instructions.

14.0 MOVEMENT JOINTS

Movement or expansion joints are to be provided only if shown or specified on the drawings and shall be plumb, continuous open vertical joints 10 mm wide, the center of each joint plugged with either expanded polystyrene or softboard and the faces of the joint subsequently sealed with a bitumastic sealant approved by the Employer's Representative.

15.0 PROTECTION OF FINISHED WALLS

The Contractor shall ensure that all finished walling will not be damaged by subsequent operations.

The Contractor shall protect newly or partially erected walling from drying out too rapidly by the sun's heat. In particular, the Contractor shall, as necessary, dependent upon the climatic conditions, keep all newly erected walling well-watered for at least three days.

16.0 STONE DRESSING

Stone shall be roughly hewn to manageable sizes, more or less prismatic in shape. The least dimension shall be not less than 100 mm.

In addition, stone for exposed masonry shall be fair chisel dressed on the exposed face and shall measure 450 mm +/- 70 mm in the longest direction.

Paving stones shall be random shapes and sizes. Maximum sizes shall not exceed 600 mm and minimum sizes shall not be less than 200 mm measured on the face. Fill-in stones shall be sized as required. Paving stones shall be 100 +/- 20 mm thick.

17.0 STONE PAVING

Stone paving blocks shall be laid on 100 mm thick tamped sand bedded or on concrete, to levels, falls and patterns shown on the Drawings.

Joints shall be cleaned to a depth approximately equal to the thickness of the paving stones and subsequently filled with cement mortar, the joints shall be finished flush with the stone surface.

TABLE 2

PERMISSIBLE TOLERANCES FOR VARIOUS TYPES OF FINISH

		Tolerances (mm) in Finish Type					
Type of Structure	**Type of Irregularity**	**F1**	**F2**	**F3**	**U1**	**U2**	**U3**
Buried concrete in foundations, Culverts, retaining wall	Departure from alignment and grade as shown on the Drawings	+/-15	-	-	+/-15	-	-
	Variations in cross-sectional dimensions	+15 - 8	-	-	-	-	-
	Abrupt	+/-15	-	-	+/-15	-	-
	Gradual	+/-15	-	-	+/-15	-	-
Exposed concrete in columns, piers, retaining walls, abutments	Departure from alignment and grade as shown on the Drawings	-	+/-15	+/-15	-	+/-8	+/-8
	Variations in cross-sectional dimensions	-	+15 -8	+15 -8	-	-	-
	Abrupt	-	+/-8	+/-4	-	+/-8	+/-4
	Gradual	-	+/-15	+/-8	-	+/-8	+/-4

CONSTRUCTION SPECIFICATION FOR CORRUGATED ASBESTOS CEMENT ROOF AND WALL CLADDING (Asbestos Items limited to existing expansion works only)

SECTION VII

1.0 **SCOPE :-**

The work covered by this specification includes furnishing all labour, materials, equipment , and performing the operations necessary to complete the Corrugated Asbestos Cement, Roof and cladding shown on the approved drawings and specified herein.

2.0 **APPLICABLE PUBLICATIONS :-**

All work shall be in accordance with the latest revision of the Indian/Equivalent Standards expect where specifically noted otherwise, or as per the manufacturer's catalogue and instruction :-

Unreinforced corrugated Asbestos Cement Sheets	I.S.	459
Fixing Accessories	I.S.	730
Laying of Asbestos Cement Sheets	I.S.	3007 (Part I)
Fixing Accessories	I.S.	730

3.0 **LAYING OF SHEETS :-**

3.1 Sheets shall be new, un-cracked and laid with smooth side up starting from eave line of roof, and from lower side on walls.

3.2 All holes for attaching bolts shall be drilled in the top of the corrugation. There shall be a minimum of two bolts across the width of the sheet at each bearing. One bolt shall be placed at the first corrugation on each side of a side lap.

3.3 All fastening bolts shall have bitumen washer placed against the outside of the sheet over which will be placed a galvanized iron washer and then a galvanized nut .

3.4 All side laps shall be one half corrugation except for Sugar Godown where the side laps shall be one and one half currugation and all end laps shall be eight inches (200 mm) minimum .

3.5 All joints where four sheets meet shall be mitred to from a snug water tight joint .

3.6 The contractor shall provide cat walks or roof boards so that no traffic is allowed directly on the asbestos cement sheet .

3.7 Ridge pieces where possible shall be attached with the same bolts as to hold the sheets in place .

3.8 All ridges shall be close fitted with a ridge finial .

3.9 All eaves shall be closed by a eave filler except as noted .

3.10 All accessories shall be fixed as per the code of practice or as suggested by the manufacturer's instruction, and as specified and instructed by the Architect .

3.11 Wind flats shall be fitted at the time of laying the sheet as specified and instructed by the Architect .

CONSTRUCTION SPECIFICATION
FOR
PLASTERING AND POINTING

SECTION VIII

1.0 **SCOPE :-**

The work covered by the specification includes furnishing all labour, materials, equipments and performing the operations necessary to complete the plastering and pointing works shown on the approved drawingsand specified herein.

2.0 **APPLICABLE PUBLICATIONS :-**

All work shall be in accordance with the latest revision of the Indian/Equivalent Standards except where specifically noted otherwise.

Cement	I.S.	269
Sand for plaster	I.S.	1542
Building Lime	I.S.	712
Structural Safety	I.S.	875

3.0 **MATERIAL :-**

3.1 Cement shall be ordinary Portland Cement confirming to I.S. 269 / Equivalent. All cement shall be suitably protected from exposure to moisture until used.

3.2 Sand shall consist of approved natural sand, manufactured sand, or a combination of both and shall be hard, clean and durable. It shall be free of organic or other detoriating material and conform to I.S. 1542 class A./Equivalent.

3.3 Building Lime shall conform to I.S. 712 class A/Equivalent.

3.4 Water shall be supplied by the contractor.

4.0 **MIXING:-**

4.1 Material which has partially set shall not be re-tempered or used. The mixer or mixing box shall be thoroughly cleaned of all set or hardened material, before materials for a new batch are loaded.

4.2 Machine Mixing :-

The sand and Cement shall be placed in the mixer dry and thoroughly mixed; then the water shall be added to obtain the proper consistency and the entire mass shall be mixed for five minutes after all ingredients are in the mixer. The entire mixer shall then be emptied before being recharged.

4.3 Hand Mixing :-

Hand mixing shall be done in a water tight mixing boat placed on the level. The dry sand and cement shall be placed in the boat and turned twice. The water shall then be added and the entire mass hoed

into the water and well mixed for 10 minutes or until the entire mass is homogeneous. The mixing boat shall be completely emptied before a new batch is mixed.

5.0 **PLASTER MIXED :-**

5.1 Plaster over exterior concrete shall be single coat or 12mm. thickness and shall be composed of one part cement, four parts plaster sand, or as noted in the schedule of quantity.

5.2 Plaster over exterior masonry shall be two coats with the first coat of 15mm. thickness and shall be composed of one part cement, three parts plaster sand. The second or finished coat shall be 10mm. thick and shall be composed of one part cement, three parts plaster sand, and finished as noted in the schedule of quantity.

5.3 Plaster over interior masonry shall be two coats with the first coat of 5mm. thickness and shall be composed of one part cement and three parts plaster sand. The second or finishing coat shall be 10mm. thick composed of one part cement, three parts plaster sand, and finished as noted in the schedule of quantity.

5.4 Plaster backing for glazed ceramic tile shall be of 15mm.thickness and shall be composed of one parts of cement and two parts plaster sand, or as specified.

5.5. Cement punning shall be applied over a first coat of the same proportions as the first coat of paragraph 5.4 and shall be not over 3mm. thick and shall be composed of one part cement, one part ground sand, or as specified.

5.6 Suspended ceilings shall be of three coats over metal lath. The first coat shall be 10mm. in thickness and shall be composed of one part cement, three parts plaster sand. The second coat shall be as same as the first coat. and finish coat shall be not over 3mm. in thickness and shall be composed of one part Lime putty and one part ground sand, or as specified.

5.7 Raised pointing shall be 18mm. high and 12mm. wide and be composed of one part cement and three parts sand.

5.8 Deep sunk pointing shall be 30mm. deep and full stone joint wide and be composed of one part cement and three parts sand or as specified.

6.0 **SURFACE PREPARATION** :-

6.1 All surfaces to receive plaster shall be cleaned of all loose material and dirt with a clean bristle brush.

6.2 Concrete surfaces shall be sufficiently roughened to provide a proper bond. If in the opinion of the Engineer, the surface is not sufficiently rough, it shall be roughed by hacking or hammering.

6.3 Stone and brick masonry surfaces shall have the mortar joints raked about 15mm. provide proper key for raised pointing and 30mm. for deep sunk pointing.

7.0 **APPLICATION** :-

7.1 First coat of two and three coat work shall be applied with sufficient material and pressure to form good full keys or good bond. This coat shall be applied to cover well and to fill out to the grounds. It shall be placed to a true plane with rod and darby and left rough.

7.2 Second coat of three coat work shall be applied upto screeds, well rodded, screeded and floated with angles true, straight and plump and just slack of grounds.

7.3 Finish coat shall be applied after under coat is dry. It shall be applied so that all surfaces are straight true, plumb, even and flush with all grounds, corners, angles and wall intersections shall be straight, sharp and true.

7.4 All coats of plaster shall be damp cured for two days and then be allowed to dry before an additional coat is applied. The previously applied plaster shall be uniformly re-dampened before additional coats are applied.

7.5 When ballies have been inserted in the walls, when they are removed, the hole shall be filled and uniformly patched with plaster conforming with balance of the wall. As far as possible the scaffold for walls shall be free from wall but shall be self-supporting, sound and safe for erection Loading.

8.0 **CLEAN-UP** :-

Upon completion of the work in a space, the contractor shall remove all rubbish, debris, scaffolds, and surplus material, and leave the area or space, broom clean.

CONSTRUCTION SPECIFICATION
FOR
DOOR AND WINDOWS

SECTION IX

1.0 SCOPE :-

The work covered by the specification includes furnishing all labour, materials, equipment, and performing operations necessary to complete the installation of all steel doors, steel windows, steel shutters, and wood doors and windows shown on the approved drawings and specified herein.

2.0 **APPLICABLE PUBLICATIONS :-**

All work shall be in accordance with the latest revision of the Indian/Equivalent Standards except where specifically noted otherwise.

Timber paneled and Glazed Doors & windows	I.S. 1003
Steel doors, windows and ventilators	I.S. 1038
Steel windows for Industrial Building	I.S. 1361
Flush door shutters (solid core Type)	I.S. 2202
Flush plywood Doors	I.S. 303
Flush Door shutters (Hollow core Type)	I.S. 2192
Prime Painting	I.S. 102
Aluminium Doors, windows and Ventilators	I.S.

3.0 **MATERIALS** :-

3.1 Steel windows shall be of the size and type shown on the drawings conforming to the applicable I.S. standard/Equivalent.

3.2 Steel Doors with glazing shall be of the size and type shown on the drawings conforming to I.S. 1038./Equivalent.

3.3 Metal clad man doors shall be hollow metal, full flush, invisibly welded, sound deadened, or 20 guage sheet; or wood-core covered with 20 guage mild steel sheet with no seams in the face of doors, or as shown on drawings.

3.4 Rolling Steel shutters shall be of the size shown on the drawings.

3.4.1 Slats or laths shall be of 18 guage mild steel or as specified.

3.4.2 Guiders shall be of mild steel angle or pressed steel.

3.4.3 Bottom rail shall be pressed 3mm. thick.

3.4.4 Shutter to be coiled on in a pipe of size sufficient to carry the door load with a deflection not to exceed 3mm. per meter of opening width and to be evenly balanced by helical springs contained in the pipe.

3.4.5 Hood shall be 22 G.M.S.

3.4.6 Locks shall be of a dead bolt type to allow door to be locked with a pad lock on either the inside or the outside.

3.5 Flush plywood Doors shall be of the size and finished as shown on the drawings or as specified and be solid core.

3.5.1. Doors on the exterior of the buildings shall have a waterproof glue line and the attachment to the core shall also be by waterproof glue.

3.5.2 Doors on the inside of the building may have W.W.R. Type of synthetic resin as adhesive.

3.6 TEAK WOOD DOORS AND WINDOWS :

3.6.1 Teak wood doors and windows shall be of the size and type shown on the drawings and conforming to the applicable I.S. standard./Equivalent.

3.6.2 All assembly of shutters, doors, windows, ventilators and frames thereof shall be exactly at right angles. In case of the frames, the right angle shall be checked from the inside surface of the respective members.

3.6.3 All members of the door, window and ventilator shutters and frames shall be straight without any wrap or bow and shall have smooth, well planed faces at right angles to each other. The frame members shall be planned on the three sides exposed at right angles to each other.

3.6.4 Heads and sills of all exterior doors, windows and those of interior doors shall have horns not less than 75mm. (3 in) in length.Heads, posts, transomes, and mullions of doors and window frames shall be made out of single piece of teak wood only.

3.6.5 Stiles, rails and solid panels in door and window shutters shall be of the same species of timber, including all member of the frame and shall be made out of one piece only.

3.6.6. Muntings and glazing bars shall be shubtenoned to the Maximum depth which the size of the member would permit or to a depth of 25mm. whichever is less. The thickness of each tenon shall be approximately one third the finished thickness of the member and the width of each tenon shall not exceed five times its thickness.

3.6.7 Solid wood panels shall be made out of one or more pieces of teak wood of not less than 125mm. (5 in) width. In order to avoid warping, splitting and cracking, normally pieces not exceeding 20 cm. (8 in) in width should be used. When made from more than one piece, the pieces shall be jointed with a continuous tongued and grooved joints; glued together and reinforced with metal dowles. Panels shall be framed into grooves to the full depth of the groove leaving an air space of 1.6mm. (1/16 in) and the faces shall be closely fitted to the sides of the groove opening for glazing, shall be rebated

and moulded out of solid teak wood and shall be provided with mitred glazing beads loosely fixed in position.

3.6.8 The contact surfaces of tenons and mortices shall be treated, before putting together, with a suitable adhesive like synthetic resin adhesive conforming to I.S. 851 /Equivalent suitable for constructional work in wood or cold setting case in glue, conforming to I.S. 649 /Equivalent. Tongue and grooved joints shall also be properly glued together with a suitable adhesive.

3.6.9 Three holdfasts shall be fixed in each side of a door frame, one at the center point and the other two at 30 cm. (12 in) from the top and bottom of the door frames. In case for windows, a pair on each side shall be fixed at quarter points of the frames, or as shown on drawing or directed by the Engineer.

3.6.10 Each door shutter shall be fixed to the frame with three hinges of the type specified, one at centre and other two at 24 cm.(9 in) from top and bottom of the shutter. Each window shutter shall be fixed to its frame with two hinges of the types specified at quarter points.

3.6.11 All doors, windows and ventilator frame and shutters shall be finished smooth with wall planes, faces. Assembled door frame without sills shall be fitted with temporary stretchers, and shall have a temporary diagonal brace fitted in-side the rebated. All surface of doors, windows and ventilator frames and shutters which are required to be pointed ultimately shall be covered evenly by brush painting with painting coat of a white lead based primer as specified in I.S. 103./Equivalent.

4.0 **INSTALLATION** :-

4.1 Steel windows and Glazed steel Doors :

4.1.1 Steel windows and glazed steel doors shall be furnished with fixing lugs, coupling bars, weather bars, typical projecting hinges, glazing clips, and glazing putty required to complete the entire installation.

4.1.2 All doors and windows shall be installed square, plumb, true to line and grade, in a first class manner and ready to receive glazing.

4.2 Metal clad doors shall be installed, with hardware furnished under another section of these specifications with three hinges per door true to line and square in opening.

4.3 Steel rolling shutters shall be installed, true to line and grade square in the opening and rigidly attached to the supporting members.

4.4 Flush plywood doors shall be installed, with hardware furnished under another section of these specifications, with three hinges per door, true to line and grade and square in opening.

5.0 DOORS

Flush doors shall be solid core construction 45 mm finished thickness with 4 mm kerero plywood on both sides. The solid core shall consist of longitudinal laminations of approved timber, traversed grain butt jointed and resin bonded under hydraulic pressure.

Vertical and horizontal edges of doors shall be lipped with edging strips tongued to the stiles in approved hardwood matching the plywood and showing a minimum of 10 mm on face.

External doors shall be solid core construction 50 mm finished thickness with 10 mm thick wrought tid timber purlin facings on both sides as described under internal doors.

Door frames shall be in wood of a finished thickness, not less than 300 mm.

Door lists shall be in wood and shall not be less than 50 mm wide and 10 mm thickness.

Doors to closets and cabinets, counters and benches shall be flush type, semi-solid cored, faced externally with plywood and internally with plywood or hardboard. The sides, tops and edges shall be lipped and edged with hardwood matching the plywood.

6.0 FURNITURE AND FITTINGS

Frames to closets, cabinets, counters and benches shall be in wood and shall not be less than 200 mm thick.

Butts, latches, locks, etc., mortised or sunk into doors and frames shall be properly and neatly fitted. Striking plates shall be properly set to hold the door firmly into the rebate without rattling and to enable latches and bolts to engage smoothly.

Plastic laminate shall be adhered to plywood, timber or insulation material in accordance with the glue manufacturer's instruction.

Exposed edges of laminated plastic shall be chamfered uniformly to approximately 20 degrees. Edges shall not be mitered.

7.0 INSPECTION

Walls, frames and other components for which carpentry and joinery work is to be attached shall be examined for defects which may affect this work. Defects shall be remedied prior to installation of carpentry and joinery work.

Requirements for plumbing, electrical and other work affecting carpentry work shall be established and provisions for passage of wiring, piping, fixtures and fittings shall be made.

Joinery materials shall be secured in place straight, true and plumb.

Beads, fillets and small members shall be fixed with round or oval brads or nails well punched in and stopped. Large members shall be fixed with brass screws, the heads let in and pelleted to match the grain.

Grounds for external and internal works shall be in softwood. Holes for plugging-in grounds must be completely filled with the grounds. Grounds for fixing joinery shall be spaced at 500 mm intervals.

Door frames, cabinets, closets, and similar items which are fixed to brick, blocks or concrete works by means of grounds, lugs or other fasteners, shall be bedded solidly in mastic painted onto the contact surface.

Internal and external surfaces unless shop finished, shall be sanded smooth, fastener holes filled and otherwise prepared, ready to receive finish.

8.0 ANTI-TERMITE TREATMENT

All timber roof trusses shall be treated with three coats of approved anti-termite solution applied in accordance with the manufacturer's instructions.

CONSTRUCTION SPECIFICATION
FOR
PAINTING

SECTION X

1.0 SCOPE :-

The work covered by this specification includes furnishing all labour, material, equipment and performing the operation necessary to complete the painting work, not covered in other sections of these specifications, shown on the approved drawings and specified herein.

2.0 **MATERIALS** :-

2.1 Lime for white washing shall be fresh white slacked Lime.

2.2 Colour wash shall be of the same material as white washing with dry colour added.

2.3 Distemper shall be Cherry Blossom oil bond distemper as manufactured by Machinery Paints and Chemicals Ltd. Bombay or approved equal colours to be selected.

2.4 Interior painting except for woodwork, doors and windows shall be "interiormat" as manufactured byMachinery Paints and Chemicals Ltd. Bombay or approved equal, colours to be selected.

2.5 Interior Painting of woodwork, shall be "Sanolite" as manufactured by Machinery Paints and Chemicals Ltd. Bombay or approved equal, colours to be selected.

2.6 Exterior painting except for concrete shall be "Exteriormat" as manufactured by Machinery Paints & Chemicals Ltd. Bombay or approved equal, colours to be selected.

2.7 Exterior painting of concrete shall be "Sealcorn" as manufactured by Machinery Paints & Chemicals Ltd. Bombay or approved equal, colours to be selected.

2.8 Enamels shall be "Solarsyn" brand as manufactured by Solar Paint & Varnish Mfg. Co., Calcutta or approved equal, colours to be selected.

2.9 Heat resistant paint shall be "Aluminium Norusto" as manufactured by Solignum Ltd. , Esses, England or approved equal.

2.10 Acid -resistant paint, aluminium paint and all special purposes paints, indicated on the Drawings, shall be of the types recommended by Imperial Chemicals Industries (India) Pvt. Ltd. or approved equal.

2.11 Thinning compounds shall be according to manufacturer's recommendations.

2.12 Primers shall be according to manufacturer's recommendations.

3.0 All materials shall be delivered to the site in original containers with labels intact and seals unbroken.

4.0 Storage of materials will be in spaces so designated by the Engineer. Whenever it should become necessary to change the location of the storage place, the contractor shall promptly move to the

designated space. The storage space floor and walls shall at all times be protected from damage, and paints shall be kept covered at all times.

5.0 **MANUFACTURERS :-**

Where a specific manufacturer of a paint, varnish, enamel, stain and so forth, is mentioned, equal consideration will be given to the base quality materials offered by one of the following manufactures :-

Imperial Chemical Industries (India) Pvt. Ltd.
Nobel Paint & Varnish Company, Bombay.
Solar Paint and Varnish Manufacturing Co. , Calcutta.
Gillanders Arbuthnot & Co. , Calcutta.
Snowcem India Ltd. , Bombay.

6.0 **PREPARATION OF SURFACES :-**

6.1 All spaces shall be broom clean before painting is started and all surface shall be clean, dry, free from foreign materials, and in the opinion of the Engineer, ready to receive the painting.

6.2 All wood surface shall be lightly sanded and dusted before priming and between each coat.

6.3 All surface shall be primed in accordance with the instructions of the manufacturer of the covering material.

6.4 Surfaces to receive white wash, colour wash and distemper, shall be properly wet before the work begins.

6.5 All concrete and plaster surface shall be spackled to fill all cracks and holes, it shall then be primed with an alkali Resistant primer.

6.6 Metal surfaces shall have all grease removed with benzine, remove rust spots and defective paint down to bare metal and touch-up with metal primer.

7.0 **PROTECTION :-**

This contractor shall remove all electric plates, surface hardware and other accessories before painting and replace when painting is completing.

8.0 **WORKMANSHIP :-**

8.1 All work shall be done by first class skilled mechanics in a workmanlike manner. All material shall be evenly applied so as to be free from runs, sags, or other defects. All coats shall be thoroughly brushed out so as to show a minimum of brush marks except enamel which shall be flowed on.

8.2 All coats shall be thoroughly dry before succeeding coat is applied with minimum of twenty four hours between coats except for white wash, colour wash, and distemper .

8.9 All finishes shall be uniform as to colour and texture.

9.0 **CLEAN-UP :-**

The contractor shall remove all paint spills, splashes, or spattered, on all fixtures, fittings or other materials including cleaning of paint off all glass.

CONSTRUCTION SPECIFICATION FOR ROOFING, DAMP-PROOFING AND WATER PROOFING

SECTION XI

1.0 **SCOPE :-**

The work covered by this specification includes furnishing all labour, material, equipment and performing the operations necessary to complete the roofing, damp-proofing, flashing and work shown on the approved drawings and specified herein.

2.0 **APPLICABLE PUBLICATIONS :-**

All work shall be in accordance with the latest revision of the Indian/Equivalent Standards except where specifically noted otherwise:-

Specification for Bitumen Felts	I.S. 1322
Code of Practice for Laying damp proof coursing	I.S. 1609
Code of Practice for water proofing roofs with Bitumen Felts	I.S. 1346
Specification for the Blown type Bitumen	I.S. 702

3.0 **MATERIALS :-**

3.1 Roofing felts shall be Hessian base Self-Finished Felt type three grade one.

3.2 Damp proofing Felts shall be Hessian base self-finished felt type three grade two.

3.3 Flashing felts shall be fiber base self-finished felt two grade two.

3.4 Laying of damp proof course in floor including the primer, bitumen binder and bitumen felts.

4.0 **TREATMENT :-**

4.1 Building roof shall have primer applied, then :-
1) Treatment 2) (a) of I.S. 1346/Equivalent

4.2 Damp-Proofing of below grade concrete shall have primer applied then :-

1) Hot Bitumen	1.2 Kg. per Sqm.
2) Damp proofing felt	--
3) Hot Bitumen	1.2 Kg. per Sqm.
4) Damp proofing felt	--
5) Hot Bitumen	1.2 Kg. per Sqm.

5.0 **SURFACE PREPARATION :-**

5.1 Roofs :-

Surfaces shall be clean, dry and have had all cracks repaired by being cut in a 'V' Section, cleaned and filled with cement grout as specified under paragraph 17 of section III of these specifications. All brickets, cants, angle fillers, chases for flashing felts shall be in place before roofing operation begins.

5.2 Walls to be damp proofed, shall be clean, dry and have all cracks filled as specified under paragraph No 5.1 preceding. All sharp corners shall be eased with cement mortar fillets.

6.0 **APPLICATION FOR ROOFING :-**

6.1 After the surface has been prepared as specified in paragraph 5.1 preceding, the entire roof surface shall be primed.

6.2 The Bitumen bonding material shall be heated to the proper temperature and maintained to that temperature until applied.

6.3 The felts shall be laid so as to be free of wrinkles, buckles and so that pronounced ridges are not formed at laps.

6.4 The mopping of the Bitumen bonding material between piles of the felts shall be uniformly applied to cover the entire surface so that at no place will felt touch felt.

6.5 Gravel shall be dry and in no case be less than 75 degree F (24 Degree Centigrade) when applied.

6.6 On the roof, the layers shall be lapped over each ridge from alternate sides in alternate layers.

7.0 **APPLICATION OF DAMP PROOFING** :-

7.1 After the surface has been prepared as specified in paragraph 5.2 preceding, the entire surface which is to receive damp proofing shall be primed.

7.2 The excavation shall be maintained in a dry condition until the work is complete.

7.3 The Bitumen bonding material shall be heated to the proper temperature and maintained to that temperature until applied.

7.4 The felts shall be cut to the proper length, cleaned and then brushed into the bonding material so as to be free of wrinkles, buckles and so that pronounced ridges are not formed at laps.

7.5 The mopping of the Bitumen bonding material between piles of the felts shall be uniformly applied to cover the entire surface, so that at no place will felt touch felt.

7.6 The second layer shall break joint midway between the joints of the layer below.

8.0 **APPLICATION OF BITUMEN LAYER** :-

8.1 Primer shall be bituminous solution of suitable viscosity to be applied to the wall or floor surface to assist adhesion of the binding material.

Bitumen binder shall conform to I.S. 702. /Equivalent. The penetration of Bitumen shall be limited to 40 when tested in accordance with I.S. 1203./Equivalent.

8.2 The exposed surface shall be thoroughly cleaned. Bitumen shall then be applied at the rate of 2 Kg per Sqm. at a temperature of not less than 121 degrees C. (250 Degrees F.) evenly throughout, and allowed to set before laying the top flooring.

9.0 **CEMENT WATER PROOFING COMPOUND** :-

9.1 Cement water proofing compound shall be as per I.S. 2645/Equivalent and shall be used as per the instruction of Architect Engineer.

9.2 The Cement water proofing compound shall be CICO products as manufactured by the Structural Water Proofing Co. Pvt. Ltd. Calcutta or approved equal.

9.3 The application shall be 2 % or 3 % of CICO cement water proofing compound or equivalent by weight of cement as specified by the Manufacturer's instructions and specifications.

10.0 **CLEAN-UP** :-

All surplus material, scraps, scaffolding shall be removed from the site at the completion of the work. All Bitumen smeared on surfaces other than those to be covered, shall be removed and the surface restored to its previous condition.

CONSTRUCTION SPECIFICATION
FOR
MISCELLANEOUS ARCHITECTURAL ITEMS

SECTION XII

1.0 **SCOPE** :-

The work covered by this specification includes furnishing all labour, materials, equipment,and performing the operations necessary to complete the Architectural finishes shown on the approved drawings and specified herein.

2.0 **APPLICABLE PUBLICATIONS** :-

All work shall be in accordance with the latest revision of the Indian/Equivalent Standards except where specifically noted otherwise.

Plain cement tiles	I.S. 1443, 1237
Marble Mosaic Tiles	I.S. 1237
Glazed Tiles	I.S. 777
Plywood for general purpose	I.S. 303
Veneered Decorative plywood	I.S. 1328
Sheet glass for Glazing	I.S. 1761

3.0 **MATERIALS** :-

3.1 Terrazzo Aggregate shall be well graded from one-half inch and down, of a colour to be selected.

3.2 Coloured Portland cement shall be "Colorcrete" as manufactured by Snowcem India Ltd., Bombay or CICO products as manufactured by Gillanders Arbuthnot & Co. Ltd. Calcutta or approved equal.

3.3 Terrazzo tiles shall be 12" x 12" x 3/4" thick, colour to be selected.

3.4 Concrete floor hardener shall be "Surfacit" as manufactured by Snowcem, India Pvt. Ltd., Bombay or CICO products as manufactured by Gillanders Arbuthnot & Co. Ltd. Calcutta or approved equal.

3.5 Glazed tile shall be of size and colour to be determined complying with I.S. 777/ Equivalent.

3.6 Marble mosaic tiles shall be as per I.S. 1237/Equivalent.

3.7 Woodwool insulation slabs shall be 3/4" (20mm) thick "Thermofriz" as manufactured by Thermolith Products Pvt. Ltd., Calcutta or approved equal.

3.8 Veneered decorative plywood shall be 1/4" (6mm) thick and four feet by eight feet sheets, complying to I.S. 132/Equivalent, with a Indian/Equivalent Teak face ply.

3.9 Glass shall be of the best quality, free from bubbles, scratches or imperfections of any kind. Glass for windows shall be clear Twenty-one ounces per square foot, except for toilet rooms which shall have opaque glass. Glazed door shall be 1/4" (6mm) plate.

3.10 Asbestos Cement louvers shall be "S" type BS-13 manufactured by Asbestos Cement Ltd., Bombay or approved equal.

3.11 Rainwater gutters shall be 8" (200mm) O.G. Type Asbestos cement, with 4" (100mm) Diameter down take pipe, swan neck, and shoe as manufactured by Asbestos Cement Ltd., Bombay or approved equal.

3.12 Plain Cement Tiles shall be as per I.S. 1443 and 1237/Equivalent.

4.0 **APPLICATION OF TERRAZZO** :-

4.1 The Concrete slab shall be cleaned of all dirt and foreign matter and the underbed 1 & 1/2" (40mm) thick composed of one part cement and four parts sand, shall be placed to a level 5/8" (15mm) below finished floor elevation.

4.2 The Division strips of 1/8" x 1" (3mm x 25mm) brass shall be installed while the under-bed is still semi-plastic as shown on the drawings but in no case over four feet (1200mm) centers each way, with the top of the strip at the elevation of the finish floor.

4.3 The topping mix composed of one part "colorcrete" to two parts marble granules shall be mixed just with sufficient water to make a workable mix.

4.4 Place topping mix into spaces between strips and tamp to a compact mass and until superfluous cement and water are extracted, then hand trowel to an even surface flush with top of strips. The finished surface shall show a minimum of 70% marble granules. The surface is to be kept moist during these operation and shall be cured at least six days.

4.5 Terrazzo base shall be applied to a backing coat of cement, sand, mortar and the base shall be set 1/4" (6mm) beyond the face of the finished wall above.

4.6 After the surface has set hard, the surfacing of the floor shall be polished with machine or hand rubbing with coarse carborundum grit stones. Next, a light grouting of colorcrete shall be rubbed over the surface to fill all voids.

4.7 The surface shall have the final grouting removed with a final carborundum grit 72 hours after final grouting, the surface shall be washed with clean water and left in a condition acceptable to the Engineer.

5.0 **APPLICATION OF TERRAZZO TILES** :-

5.1 The concrete slab shall be cleaned of all dirt and foreign matter and the under-bed 1 & 1/4" (30mm) thick composed of one part cement and four parts sand and shall be placed to a level 3/4" (20mm) below finished door elevation.

5.2 The tile shall be embedded in the under-bed with a 1/4" (6mm) joint space on all sides.

5.3 After the tile has been set the joints shall be filled with colorcrete.

5.4 After the joints have been filled, all surplus colorcrete shall be wiped off, and the surface cured for six days.

5.5 After the surface has cured, it shall be washed with clean water and left in a condition acceptable to the Engineer.

6.0 **APPLICATION OF CONCRETE HARDNER** :-

6.1 The concrete surface shall be swept and washed with clean water to remove all dirt and foreign matter. All cracks shall be filled with admixture of cement and water.

6.2 Surface shall be well mixed with equal quantity of water immediately before using.

6.3 The diluted mixture shall be evenly sprinkled on the surface with a fine spray in a generous quantity but without leaving actual pools on the surface.

6.4 Twenty-four hours later the surface shall be cleaned if necessary and a second coat, similar to the first shall be applied.

6.5 CICO surface hardener or CICO hard seal liquid concrete hardener or equivalent approved, shall be used as specified as per the instructions of manufacturer.

7.0 **APPLICATION OF SHAHABAD FLOORING** :-

7.1 The slab stones specified in the item shall be got approved by the Engineer. At its thinnest part, no stone shall be thinner than minimum specified. The stone shall be hard, sound, durable, resistance to wear as per the size and shape directed by the Engineer. Uniformity of size shall be maintained and shall have plain surface. They shall have, even, natural surfaces free from broken flakes on the top and shall be chiseled on edges to half its depth, true and square to ensure uniform width of joint. The surfaces and the edges of the slab shall be straight. Samples of stone slabs shall be got approved by the Engineer and the slab to be used shall confirm to the approved sample.

7.2 Cement mortar or lime mortar for the bedding and cement mortar for pointing shall be of the proportion as specified in the item.

7.3 The base as specified shall be laid and compacted to a true plain surface below the level of the finished floor to the extent of the thickness of the slabs and mortar bedding.

7.4 The surface to receive shahabad slabs shall be cleaned off all dirt and foreign matter. Under-bed of 20mm thick composed of one part cement and four parts sand or as specified in item shall be placed to a level. The required slope shall be given to the bed.

7.5 Before laying, the slabs shall be thoroughly wetted with clean water. Cement grout of honey like consistency shall be spread on the mortar bed over the area which could be covered with the slabs within half an hour. The specified type of stone slabs shall be laid on the neat cement float and shall be evenly and firmly bedded with the help of wooden mallet tapped gently till there is no hollow sound from the slabs. The joint shall be 6mm to 10mm thick and filled solidly with mortar for full depth and shall be struck smooth but there shall be no smearing of mortar over the slabs. All surplus grout shall be wiped off. The joints shall be of uniform thickness and straight lines to give continuous parallel long joints with cross joints at right angles. Diamond pattern paving slabs shall be square and laid with triangular shaped slabs to make up the edges. In plain pattern, stones on each course shall break joint with those in the next.

7.6 The joints shall be pointed with cement mortar of the proportion mentioned in the item.

7.7 The flooring shall be kept well wetted with damp sand or water for 14 days. It shall be kept undisturbed for at least seven days.

7.8 After the surface has cured, it shall be washed with clean water and left in a condition acceptable to the Engineer/Architect.

8.0 **APPLICATION OF INDIAN PATENT STONE** :-

8.1 The cement concrete shall confirm to specifications section III. The coarse aggregate shall be carefully selected, sufficiently tough and hard stone pieces broken in a manner that will provide particles of approximately cubical shape affording good interlocking. The maximum size of the coarse aggregate shall be 12mm. The fine aggregate shall consist of properly graded sand.

The proportion of mix shall be M 150 (1:2:4). The least amount of water that will produce a workable mix and will allow finishing without excessive troweling shall be used.

8.2 The sub-grade for the concrete floor shall be of sufficient thickness and properly executed as per specifications. The sub-grade shall be at proper levels and slope, well compacted and cured. The top surface shall be kept slightly rough.

8.3 The surface of the sub-grade shall be cleaned of all loose materials and moistened immediately before laying the concrete floor. The concrete flooring shall be laid in alternate bays not exceeding 6 Sq.m. The edge of each panel into which the floor is divided shall be supported by flat bars of steel or wood duly oiled to prevent stickings. The bars shall be removed before filling in the adjoining panels.

8.4 The concrete shall be laid immediately after mixing. The formation of voids or honey comb pockets shall be prevented. Compacting and leveling shall be carried out with a heavy straight edge. The floating shall be followed by steel trowelling after the concrete has hardened sufficiently to prevent excess of fine material from working to the surface. The finish shall be brought to a smooth and even surface free from defects and blemishes and tested with straight edges. After the concrete has sufficiently dried, the rendering with a thin coat of 1:1 cement mortar with fine sand and uniform float shall be carried out. Approved colour pigment confirming to I.S.459 /Equivalent shall be added to cement mortar to give the required colour and shade to the flooring as per direction of the Engineer. When the cement mortar rendering is sufficiently stiff, lines shall be marked on it with stringes or by any device to give the appearance as specified or directed by the Engineer/Architect.

8.5 After the concrete in the bays has set, the joints of the panels shall be filled with cement cream or with suitable bitumastic compounds shown on the drawings or directed by the Engineer.

8.6 Vertical edges shall be neatly marked on the surface of the concrete with appointed trowel after filling the joints.

8.7 When rendering is somewhat stiff, neat cement of approved colour cement mixed with the required shade of approved pigment may be sprinkled on the surface and rubbed lightly to give smooth cement coloured surface. Surface shall be protected from direct sun when it is green.

8.8 Curing shall start on the next day after finishing and shall be continued for 14 days.

8.9 Even the small strips of I.P.S. in between shahabad stone flooring panels, shall be carried out in the same manner as specified above and as directed by the Engineer, and as shown on the drawing, plan or schedule of quantity.

9.0 **APPLICATION OF GLAZED TILE : -**

9.1 The surface to receive glazed ceramic tile shall be clean and free from foreign materials. Before the setting bed is spread, the surface shall be thoroughly moistened with clean fresh water. All excess water shall be removed.

9.2 For floors the setting bed shall be composed of one part cement and four parts sand.

9.3 For walls, if the scratch or backing coat is sufficiently even and true,a plumb coat composed of one part cement, 1/2 part lime putty and four parts sand shall be applied to true the surface.

9.4 For floors, the cement mortar shall be applied over the setting bed until the surface is absolutely true and smooth and even in plane as to drainage. The entire surface shall be sprinkled with cement and the tiles placed, with 1/8" (3mm) joints, and beaten into the mortar until true to line and even. As soon as the cement mortar beds have set sufficiently, the tiled surface shall be washed, and the joints between the tiles pointed with a cream consistency mixture of one part white portland cement and one part white sand.

9.5 For vertical surfaces, the tile shall be buttered with the setting mortar and tamped into place, with 1/8" (3mm) joints and brought to a plumb and true surface flush with other tile. The back of each tile shall be covered with mortar to make a even and level bed. All joints shall be plumb and true and the joining strings or wedges shall be removed before pointing. The pointing of joints shall be as in paragraph 9.4 preceding.

9.6 Clean-up :

After the tile joints have been pointed, all the tile surfaces shall be wiped clean. After the joints have set, all tile surfaces shall be washed with clean water and left in a condition satisfactory to the Engineer.

10.0 **APPLICATION OF THERMOFRIZ :-**

10.1 The sheets of Thermofriz shall be unbroken and be set with full sheets in the field with any irregularities taken up in the border.

10.2 The sheets shall be face nailed with nails 1 1/2" (40mm) long set 1/2" (12 mm) from the edge of the sheet. All joints shall be tight butt joints.

10.3 After all sheets are in place, the joints shall be covered with wood battens 1/4"x2" (6mmx50mm) which shall be attached through the joint of the Thermofriz with counter sunk screws 2" (50mm) long. The joints of the battens shall be tight, smooth and square.

10.4 Clean-up :

At the completion of installation, all excess materials and debris shall be removed from the site.

11.0 **INSTALLATION OF TEAK DECORATIVE PANELLING :-**

11.1 The surface to receive the teak paneling shall be true to line and grade and all backing walls shall be dry.

11.2 The paneling shall be applied to the ceiling first starting in the middle of the space with full sheets and working to the walls where irregularities shall be taken up.

11.3 The wall paneling shall begin in the middle of wall surface with a full width sheet and irregularities shall be taken up at the corners.

11.4 All sheets shall be blind nailed with finishing nails 1 & 1/4" (32mm) long. Where blind nailing cannot be done, the nails shall be set 1/8" (3mm) and the hole filled with a putty coloured to match the panel.

11.5 All panel surfaces shall be fine sanded and then finished with three applications of a dull finish wax.

11.6 Clean-up :

At the completion of the paneling work, all debris shall be removed from the site.

12.1 All rebates not primed shall be painted black before the installation of glass.

12.2 All glass panes shall have 1/6" (4mm) clearance all around the pane.

12.3 All glass shall be back puttied so as to fill the void between the glass and the rebate.

12.4 Putting shall be carefully done so that putty runs in neat straight lines parallel with the inside of the munting or rebate, corners shall be carefully made and excess putty removed.

12.5 Glass Breakage :-

The contractor shall be responsible for all glass broken because of faulty setting and shall replace same at his own expense.

12.6 Cleaning :

At the completion of the construction, the contractor shall remove all dirt, stains, paint, excess putty and any other foreign materials and clean and polish all glass.

13.0 **APPLICATION OF ASBESTOS CEMENT LOUVERS :-**

13.1 Louvers shall be placed at eight inches (200mm) on centre vertically with galvanized iron bolts at each bearing.

13.2 Bitumen washers, galvanized washers and galvanized nuts shall be as per manufacturer's standard.

13.3 Louvers shall be placed with a four inch (100mm) lap at each end.

14.0 **APPLICATION OF ASBESTOS CEMENT RAINWATER GUTTERS AND DOWN TAKE PIPES :-**

14.1 Rainwater gutters shall be supported with a galvanized iron flat strap near the socket end and in the middle of the gutter length.All nozzels shall have a support at both ends, swan necks, down take pipes and shoes shall rigidly be supported to the wall with galvanized straps not over three feet (900mm) apart.

14.2 Jointing of Gutters :

At each joint of the gutter a one quarter inch (6mm) diameter Asbestos rope smeared with Bitumastic jointing compound shall be placed between the two sections joined around the galvanized bolt. This space shall then be filled with the Bitumastic compound. A bitumen washer and a galvanized washer shall be used under all bolts and nuts.

14.3 Line of Gutters :-

The slope of gutters shall not be over two inches (50mm) between high point and the low point of the gutter.

15.0 **APPLICATION OF PLAIN CEMENT AND MARBLE MOSAIC TILES :-**

15.1 The cement slab or bed shall be cleaned of all dirt and foreign matters.

15.2 The tiles shall be as per I.S. 1237 /Equivalent of specified cement colour, patterns, marble chips, designs, thickness and size as directed for marble mosaic and as per I.S. 1443 /Equivalent for plain cement tiles or as directed by the Architect/Engineer.

15.3 The few specimens of the tiles to be used shall be got approved from the Architect/Engineer & shall be deposited by the Contractor in the office of the Architect for reference. The supply shall confirm to the sample.

15.4 Fixing, polishing & cleaning shall be done entirely as per I.S. 1443 /Equivalent. Polishing shall be done by machine to a smooth & plane surface.

15.5 The item includes cleaning the base and laying mortar and leveling, providing and laying the tiles in neat cement floor on the bedding mortar, filling the joints of tiles with neat cement or colour cement slurry, curing, all labour, materials, use of tools & Equipments for carrying out the items as specified.

15.6 The amount of water while preparing the mortar for bedding shall be minimum as to give sufficient plasticity for laying, and free from hard lumps, evenly and smoothly spread over the base to proper level or slope. The thickness of bedding shall be not less than 12mm or more than 25mm in any place. The tiles shall be laid on the mortar bedding when it is still plastic but turned sufficient stiff to offer the firm cushioning.

15.7 The tiles shall be soaked in water for at least 2 hrs. before laying. Neat cement grout of honey like consistency shall be spread over the bedding mortar to cover the area which can be tiled within half an hour.

Each tile shall be pressed & gently tapped with wooden mallet till it is properly bedded in & in level with the adjoining tiles. The edges of tiles shall be in straight lines and as clean as possible. The joints shall be grounded with white cement slurry. The joint between tiles shall not exceed 1.5 mm (about 1/16") wide. The flooring shall be cured and allowed to mature undisturbed for 14 days.

15.8 The surplus cement grout shall be cleaned off and remove before set or after every days fixing, works, Machine polishing shall be carried out as per the instruction of the Architect and the flooring shall be got cleared up and washed with water and kept ready for occupation.

16.0 **APPLICATION OF TAPECRETE FLOOR TOPPINGS :-**

16.1 Tapecrete is a service mark of FRC composites Limited, Canada, a joint venture between the Structural Water Proofing company Pvt., Ltd., Calcutta.

16.2 Prior to installation, all surfaces must be properly cleaned, free of foreign matter and thoroughly wetted.

16.3 Depression, if any, shall be filled and leveled using Tapecrete Fillers.

16.4 Tapecrete Membranes shall be applied in the required number of Fabric layers of 3 mm, 6 mm thickness as specified. Each layer of Fabric in the membrane shall provide a uniform thickness of about 1.5mm (1/16").

16.5 Topping shall be applied by the skill labour by way of trowelling, spraying and by other approved mechanized means.

16.6 Tapecrete system is cured by air drying. The system shall be applied with air temperatures above 7 degree C (45degree F). During the First 12-Hours of curing it must be protected from abrasion, rain, and other adverse conditions. No traffic shall be allowed on a standard Tapecrete surface within 48 hours after installation.

16.7 The flooring shall be open for surface traffic after 7 to 10 days.

16.8 For 8mm thickness Tapecrete Topping, material required for one cu.m is cement 650kg/Cum, Polymer P151-338kg./m3 and fine silica sand 1300 kg/m3 while for 6mm thickness cement 512 kg/m3, P151-266 kg/m3, coarse silica sand 768 kg/m3 and fine silica sand - 768 kg/m3.

17.0 CARPENTRY AND JOINERY

17.1 INTRODUCTION

This section describes the materials and workmanship required for the construction of wood roof framing, wood cabinets, doors, door frames, wood trim and miscellaneous other items to be constructed of wood.

17.2 REFERENCES

In this section, reference to relevant Indian / Equivalent Standards shall be made.

17.3 SAMPLES

Samples, measuring 300 x 300 mm, of each type of paneling, of each type of solid wood, chipboard or plywood and of laminated plastic shall be submitted in duplicate for approval.

Samples, measuring 300 mm in length, of each type of trim and molding shall be submitted in duplicate for approval.

17.4 QUALITY CONTROL

Certificates of treatment from vacuum/pressure impregnation plant shall be submitted for preservative treated timber.

Preservative treated timber shall be branded so that it is distinguishable from non-treated timber.

17.5 PRODUCT DATA

Product data shall be submitted for approval for the following

(a) Wood preservative treatment process.
(b) Preservative for use on cut surfaces of vacuum pressure impregnated timber.
(c) Preservative for use on timber to be encased in masonry.

17.6 PRODUCT DELIVERY AND STORAGE

Timber shall be protected from rain and dampness and shall be packaged as far as practicable, to prevent moisture absorption, contamination by dirt, oil, grease or other harmful materials, and to prevent damage or loss during transport and storage.

Transport and storage requirements as recommended by the preservative treatment plant shall be strictly adhered to.

Timber and assembled woodwork shall be stored off the ground in weatherproof enclosures, timber shall be open stacked.

Packaged materials shall be clearly labeled with manufacturer's name. Contents, quality and quantity shall be clearly marked on packages.

17.7 PROTECTION

Installed cabinet work, trim and other joinery shall be protected in a manner and until such time as directed.

17.8 SHOP DRAWINGS

Shop drawings of built in cabinets, counters, closets, shelves and benches shall be submitted for approval. Shop drawings shall show general arrangement, details of construction, jointing, fastening, finishing, other related details, wood species and descriptions of other materials used.

17.9 MATERIALS

Timber shall be hard and soft woods in accordance with their definition as given by European Union and Indian Standards.

Unless otherwise specified or shown on Drawings, timber shall be used as follows:

(a) Carpentry work -

I Trusses, purlins, ceiling battens and soffit battens – to be determined

II Fascia and barge boards and skirting – to be determined

III Wedges, studs, backings and blocks – to be determined

(b) Joinery work - cabinets, counters, closets, shelves and benches - to be determined

Glue for treated timber shall be of resin type and subject to approval.

Plywood shall conform to the requirements I.S. /Equivalent and shall be first grade kerero plywood.

Chipboard shall conform to the requirements of I.S./Equivalent. The board shall be weatherproof and bonded with synthetic resin.

Laminated plastic sheeting shall be "Formica Decorative Laminate" 1.6 mm thick. The color and pattern shall be subject to approval.

Nails, screws, bolts, spikes, fasteners, brackets, supports, guides, stops and holders shall be of size, material and finish consistent with the function. Nails shall comply with the requirements of I.S./Equivalent.

Closet, cabinet and counter hardware shall be chromium plated brass subject to approval.

Door hinges shall be forged iron, regular type with removable threaded pivot. The handle shall be chromium plated brass level handle and the locks shall be Yale type.

17.10 FABRICATION AND MANUFACTURE - GENERAL

Timber shall be well seasoned, sawn square and in straight lengths and shall be free of dirt.

Timber shall be inspected as it arrives and any timber not approved shall be removed forthwith.

Timber shall be dried to a moisture content of not more than 20% prior to preservative treatment.

Timber shall be cut, machined, planed, notched and bored prior to preservative treatment as far as practicable. Where cross-cutting, notching or boring or treated timber cannot be avoided, the exposed surface shall be "brush-treated" with approved type and grain preservative.

Timber shall be pressure impregnated with the approved preservative at a pressure of not less than 1 MPa and in accordance with the chemical manufacturer's instructions.

After pressure treatment timber shall be reduced to a moisture content of not more than 12% for joinery work and 20% for carpentry work.

Pressure treated surfaces to receive glue shall be wire brushed or lightly sanded to remove dirt and excess galts.

Actual dimensions of scantlings for both carpentry and joinery shall not vary from the specified dimensions and shall be uniform throughout. Boards shall hold up to the specified thickness and timber shall be as long as possible and practicable in order to eliminate joints. Profiles of sections shall not be modified from those shown on Drawings without prior approval.

Joinery shall be accurately set out on board to full size for the information and guidance of the artisans before commencing the respective work, with all joints, iron work and other works connected therewith fully delineated. Such setting out must be approved before joinery is commenced.

Joinery shall be cut and framed together soon after the commencement of the building or as is practicable, but is not to be wedged up or glued until the building is ready for fixing same.

Joinery shall be properly mortised, tenoned, housed, shouldered, dovetailed, notched, wedged, pinned, etc. as directed and all properly glued up with approved resin type glue.

Joints in joinery shall be detailed, designed and secured to resist or compensate for any stresses to which they may be subjected. Nails shall be punched.

Joints shall be made loose where shrinkage is liable to occur, and glued where sealed joints are required.

Exposed surface of joinery work shall be wrought and all arises "eased off" by planning and sand papering to an approved finish.

18.0 **GLAZING**

18.1 REFERENCES

In this section reference is made to the relevant Indian / Equivalent standards:

18.2 MATERIALS

Glass shall conform to I.S / Equivalent and cutting and edgework on glass shall conform to I.S / Equivalent.

Glass shall be of such quality that surface deterioration will not develop after glazing (if under normal conditions of use).

Glass shall be free from flaws, bubbles, specks and other imperfections.

Clear sheet glass for glazing shall be ordinary transparent glass manufactured by the flat drawn process.

Figured/frosted glass shall be clear cast glass manufactured by the rolling process.

Figured/frosted glass shall be of the deep pattern type to produce greater obscuration and diffusion.

Lead glass panels shall be panels of glass held together with lead clamps.

Mirrors shall be 6 mm thick special selected (SSG) silvered plate glass with polished edges.

Glass louvers shall be clear or frosted sheet glass with ground edges.

Putty for glazing in metal frames shall be quick hard-setting tropical putty specially manufactured for use with metal windows.

18.3 FIXING AND CLEANING

Rebates and grooves shall be clean, dry and unobstructed and primed at the time of sealing and glazing.

Edge clearance shall be equal all round each pane, and no more than 2 mm play all around and where puttied shall be clipped to metal frames.

External glazing shall be wind and watertight on completion.
Smears and excess compound and sealant shall be removed.

Both faces shall be cleaned with approved cleaner and the surface left free from scratches.

Fixing of mirrors to wall shall be with chromium plated screws.

CONSTRUCTION SPECIFICATION
FOR
ROUGH AND FINISH HARDWARE

SECTION XIII

1.0 SCOPE :-

The work covered by this specification includes furnishing all labour, material, equipment, and performing the operations necessary to complete the rough and finish, Hardware work shown on the approved drawings and specified herein.

2.0 **APPLICABLE PUBLICATIONS :-**

All work shall be in accordance with the latest revision of the Indian/Equivalent Standards except where specifically noted otherwise.

Cold Rolled Mild steel Bolt Hinges	I.S.	1341
Tower Bolts	I.S.	204
Butt hinges	I.S.	205
Tee and strap Hinges	I.S.	206
Gate and shutter Hooks and Eyes	I.S.	207
Door Handles	I.S.	208
Sliding Door Bolts for use with Padslocks	I.S.	281
Parliament Hinges	I.S.	362
Hasps and Staples	I.S.	363

3.0 **MATERIAL** :-

All material shall be new and delivered to the site in unopened manufacturer's containers. All Hardware shall be delivered complete with all component parts including screws of proper size. They shall be sound, strong and of the best quality. They shall be of brass or oxidised brass of Aluminium as mentioned in the item or directed by Engineer.

3.1 All of the following items shall be "Jayant" as manufactured by Jayant Metal Manufacturing Co. Bombay, or approved equal in Brass, or as specified in the schedule of item.

3.1.1 Door Hinges 4" x 1" (100mm x 25mm)
3.1.2 Toilet Door Hinges 3" x 1" (75mm x 25mm)
3.1.3 Swinging Door Hinge
3.1.4 Skeleton Bolts sectional
3.1.5 Flush Bolts level type 6" x 1" (150mm x 25mm)
3.1.6 Aldrops 12" & 5/8" (300mm & 15mm)
3.1.7 Safety Hasps and Staples 6" x 1 1/2" (150mm x 38mm)
3.1.8 Finger plates 3" x 8"1/8" (75mm x 200mm x 3mm)
3.1.9 Coat Hook
3.1.10 Door stopper and holder
3.1.11 Toilet compartment Latch
3.1.12 Toilet Compartment latch for Administration Buildings
3.1.13 Stair Nosing for Administration Building 2 & 1/2" (65mm)
3.1.14 Door Pulls 10" x 1-1 1/2" x 1/8" (250mmx38mmx3mm)
3.1.15 Rim Lock 4" (100mm)
3.1.16 Tumbler Holder

3.1.17 Locks and Handles
3.1.18 Barrel Bolts 9" x 1 1/2" (230mm x 38mm) with 1/2" (12mm) sheet.

3.2 Samples of all fixtures and fastening shall be got approved from the Engineer and deposited in his office for reference. The following items shall be Godrej as supplied by Godrej and Boyce Mfg., Bombay, or equal.

3.2.1 Tubular Latch

3.2.2 Night Latch - Anchor Brand

3.3 Wrought steel butt hinges shall be Mowjee No. 959 4" (100mm) Long as supplied by M.C. Mowjee and Co. or approved equal.

4.0 **INSTALLATION :-**

4.1 All the fixtures shall be fixed to the joinery in a secure and efficient manner or as specified by the Manufacturer's directions and shall be installed plumb, true and secured with the proper fastenings so as to make all work, rigid and firm.

4.2 Any of the fixtures damaged during fixing shall be removed and new ones fixed in their place and the surface of joinery made good where affected, at the contractors expenses. When the type is not mentioned on the drawings or the item, it shall be hung or swung as directed by the Engineer.

4.3 Aldrops, safety hasps and staple locks and handles and tubular latches shall be installed 36" (915mm) from the floor.

4.4 Night latches shall be installed 48" (1200mm) from the floor.

4.5 All locks and tubular latches shall be installed with brass strike plates.

5.0 **PROTECTION :-**
Hardware that might be damaged by the construction work shall be protected during the progress of the work and uncovered at its completion.

6.0 **CLEANING :-**Upon the completion of the construction, all hardware shall be cleaned and polished and left in perfect operating condition and to the satisfaction of the Engineer.

CONSTRUCTION SPECIFICATION
FOR
PLUMBING

SECTION XIV

1.0 SCOPE :-

The work covered by this specification includes furnishing all labour, materials, equipment, and performing the operations necessary to complete the plumbing work shown on the approved drawings and specified herein.

2.0 APPLICABLE PUBLICATIONS :-

All work shall be in accordance with the latest revision of the Indian/Equivalent Standards except where specifically noted otherwise.

* Specification for white glazed Earthenware Sanitary appliances.	I.S.	771
* Specification for Enamelled cast iron Sanitary appliances.	I.S.	772
* Specification for flushing cisterns	I.S.	774
* Brackets and supports for lavatory basins and sinks.	I.S.	775
* Specification for sa gun metal gate, globe and check valves	I.S.	778
* Specification for sand cast brass screw down bib taps and stop taps	I.S.	781
* Specification for caulking Lead	I.S.	782
* Specification for centrifugally cast iron pressure pipes	I.S.	1536
* Specification for vertically cast cast iron pressure pipes	I.S.	1538
* Specification for cast iron manhole covers and frames	I.S.	1726

3.0 WORK INCLUDED :-

The contractor shall furnish and install all the fixtures, fittings, all piping, underground and above ground complete with all valves, taps, fittings, insulation, and all items including cutting all chases and restoring them to their original condition all to the satisfaction of the Engineer/Architect.

4.0 MATERIALS :-

4.1 European type water closets:

4.1.1 Shall be new, unmarred, white glazed, wash down type, of one piece construction with integral flushing rim and water inlet with integral "S" trap or "P" trap complete with low level cistern Parryware or equal.

4.1.2 All other European type water closets shall be as specified in paragraph 4.1.1. preceding except for cistern.

4.2 Indian type water closets shall be new, unmarred, white glazed, wash down type with integral flushing rim, and water inlet, 58 cm (23") long or as specified in item confirming to I.S.771/Equivalent type two complete with "S" or "P"trap.

4.3 Wash basins shall be new, unmarred, white glazed, flat-back single tap 56cm. x 40cm. (22" x 16") or as specified in item, complete with non-ferrous waste chain, fittings and stopper, chrome plated "P" trap, support brackets with studs, and nuts and backing plate, confirming with I.S. 771./ Equivalent.

4.4 Urinals shall be new, unmarred, white glazed, flat back, one piece construction with an integral flushing rim and water inlet, complete with fixing bolts and backing plate, confirming with I.S 771/Equivalent.

4.5 European type water closet seats and lids shall be Bestolite as manufactured by Indian Plastics Ltd.,Bombay, or approved equal.

4.5.1 In men's toilet rooms, all seats shall be open front type.

4.5.2 In women's toilet rooms,seats shall be closed type.

4.6 Sinks shall be new, enameled, cast iron, two compartment, one piece construction 106 cmx79 cm x 25 cm with centre over-flow with one waste outlet in each compartment complete with waste plug, non-ferrous waste chain, fittings and stopper, fixing brackets with stud bolts, nuts, "S" trap and confirm to I.S.772 / Equivalent except if specified otherwise.

4.7 Flushing water closets, except as specified in paragraph 4.1.1 preceding, shall be (13.60 Lit) capacity siphonic high level cistern / PVC Cistern, complete with concealed type brackets, fordham, as supplied by N.M. Mehta and Co., bombay, or approved equal.

4.8 Faucet shall be 1/2" (12mm) chrome plated with American standard tapered threads.

4.8.1 For wash basins, faucets shall be pillar tap.

4.8.2 For sinks, faucets shall be combined mixing faucet with swivel nozzel similar to shanks A-9287.

4.8.3 For showers, faucets shall be combined mixing faucet or as specified.

4.8.4 For washing troughs, faucets shall be similar to shanks D-5730 or as specified.

4.9 Shower heads shall be chrome plate brass 10 cm (4") diameter with 0.15 cm holes and shall be complete with chrome plated coupling 6 mm with American standard tapered threads.

4.10 Urinal trough shall be fabricated from 16 gauge galvanised iron sheet. They shall be 40 cm wide 25 cm deep and length as shown on the drawing. The troughs shall be flat backed with a 12 cm flat bottom connection, the front and back with a proper radius, the front plate shall be 60 degree out from the vertical away from the back. The ends shall be closed and the top of the ends and front shall have a circular closed seam. The bottom of trough shall be fitted with 4 cm x 2.5 cm reducing bushes and be rigidly attached in a cavity at about 60 cm on centre and starting 30 cm from each end. Each trough shall be supplied with fixing brackets at 60 cm on centre complete with all bolts, nuts, etc.

4.11 Wash trough shall be fabricated from 16 gauge galvanised iron sheet. They shall be 35 cm wide, 25 cm deep and length as shown on the drawings. The troughs be flat backed with a three inch (75mm) horizontal projection outwards on top with 12 cm flat bottom connecting the front and back with a

proper radius, the front place shall be 30 degree out from the vertical away from the back. The ends shall be closed and the top of the ends and front shall have a circular closed seam. The bottom of the trough shall be fitted with 4 cm x 2.5 cm reducing bushes and be rigidly attached in a cavity at about 60 cm on centre and starting 30 cm from each end. Each trough shall be supplied with fixing brackets at 60 cm on centres complete with all bolts, nuts etc.

4.12 Galvanised pipe and fittings shall be new, free from cracks, threaded with tapered threads and confirm to I.S. 1239-1958/Equivalent.

4.12.1 Pipe sizes from 12 mm through 40 mm shall be medium class.

4.12.2 Pipe sizes above 40 mm shall be medium class.

4.13 Black iron pipe and fittings shall be new, free from cracks, threaded with tapered threads and conform to I.S 1239- 1958./Equivalent.

4.13.1 Pipe sizes from 12 mm through 40 mm shall be medium class.

4.13.2 Pipe sizes above 40 mm shall be medium class.

4.14 Cast iron pipe shall be new, free from cracks and blow holes, with spigots and/or sockets suitable for lead joints, without head, confirming to I.S. 1536 or 1537 class B./Equivalent.

4.15 Cast iron fittings shall be new, free from cracks and blow holes, with spigots and/or sockets suitable for lead joints, confirming to I.S. 1538 heavy type/Equivalent.

4.16 Gate valves shall be split taper wedge rising spindle gunmetal, confirming to I.S. 778/ Equivalent except female ends threaded to National Pipe Tapered threads.

4.17 Globe valves shall be renewable disk rising spindle, all gunmetal, confirming to I.S. 778 / Equivalent except female ends threaded to National pipe Tapered threads.

4.18 Stop taps shall confirm to I.S. 781 / Equivalent except female ends shall have threads confirming to National pipe Tapered Threads and shall be chrome plated.

4.19 Bib-taps except as hereinbefore specified, shall confirm with I.S. 781 / Equivalent except threads shall confirm to National Pipe Tapered Threads and shall have a G.I. socket screwed on the male end.

4.20 Floor drains shall be cast iron with an integral "P" trap. It shall have a separate grating which is attachable with counter sunk screws.

4.21 Cowls for all events shall be cast iron and or PVC with 12mm wide slots all around and a domes top. The female end shall have National Pipe Tapered Threads to receive a 75 mm pipe.

4.22 Water Coolers :- Shall be instantaneous pressure type with a 14 G.P.H. nominal cooling capacity, with a hooded angle streamjet, foot pedal operated, Blue star PT-100 as manufactured by Blue Star Industries Pvt. Ltd., Bombay, or approved equal.

4.23 Toilet paper holder at European type water closet shall be white, shanks no. 7643 or approved equal.

4.24 Soap Dishes in shower Rooms shall be shanks no.119 or approved equal.

5.0 **INSTALLATION :-**

5.1 Drainage Pipes :-

5.1.1 All lines shall be pitched as shown on the drawings but in no case less than 3mm per 30 cm.

5.1.2 Hung lines shall be supported by at least 18 G x 1-1/2" galvanized iron strap hangers with two straps per pipe length. Verticle line shall be strongly secured to the structure.

5.1.3 Provide clean out at every change in direction of waste lines. All clean outs under floors shall be provided with flush to the floor plates of cast iron.

5.2 Outlet size for fixtures :

Outlet and vent lines shall be as follows :-

Fixtures	Drainage	Vent
Water closets	10 cm (4")	5 cm (2")
Urinals	5 cm (2")	4 cm (1-1/2")
Urinal Troughs	5 cm	4 cm
Sinks	5 cm	4 cm
Wash Basins	4 cm	4 cm
Drink fountains	4 cm	4 cm

5.3 **JOINTS :**

5.3.1 Cast iron shall be caulked with Oakum and Soft caulking lead.

5.3.2 Threaded joints reamed and with red lead on male end only.

5.4 Vents shall be located as shown on the drawings and shall be increased to a size to fit the cowl before going through the roof. ON sloping roofs, vents shall be cut off 10 cm above the high side of the roof at the vent, on Flat roofs vents shall be cut off 30 cm above the roof.

5.5 Cool Water System :-

All Piping shall be run so that the entire system can be drained at low points by means of drain cocks. All lines shall be pitched 2.5 cm in eight metres.

5.6 Hot water system and air lines :

All piping shall be pitched up towards fixtures and risers, and shall have drain cocks at the low points for draining the system. All lines shall be pitched 2.5 cm in eight metres.

5.7 Steam Piping :-

5.7.1 Complete circulation shall be obtained through the system and shall function noiselessly. Steam supply shall be pitched 2.5 cm in eight metres and wet return lines shall be pitched 2.5 cm in twelve metres.

5.7.2 Except for return lines, all piping shall be covered properly pasted and banded with 2.5cm. of 80 % magnesia and then finished smooth and hard with an Asbestos cement Paste 6mm Thick.

5.8 Under-ground piping :

5.8.1 All under-ground piping except cast iron shall be wrapped with Hessian cloth and then well coated with Bitumen, applied so as to completely cover the cloth. Cast iron pipe shall be covered with Bitumen only.

5.8.2 All pipes shall be well supported and for cast iron pipe, recesses in the bearing shall be made for the sockets.

5.8.3 All pipes shall be tested before the trench is the back filled.

5.9 Piping :

5.9.1 Piping where not concealed shall be run as high as possible parallel to and as close as possible to the walls.

5.9.2 Hot water and steam lines shall be kept at least 15cm. away from cold water lines.

5.9.3 Where pipes are placed in chases, the chase shall be as small as practical and after the line is tested, shall be repaired with a dry cement paste of one part cement to three parts sand. The repair to the chase includes the finish to match the surrounding material in texture and colour.

6.0 **PIPE SUPPORTS :-**

6.1 All horizontal runs of pipes except as hereinbefore specified, shall be supported at as follows :-

12mm pipe	--	1.52m
25mm pipe	--	2.13m
40mm pipe	--	2.75m
50mm pipe	--	3.00m

6.2 All vertical runs of pipes shall be rigidly attached to the framing at not over 1.80m on centre

6.3 **PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING ANDEXCAVATION**

1. GRANULAR BEDS

Material for granular beds shall be graded gravel with a maximum size of 20 mm. The gravel shall be of clean hard stone, free from dust and clay and organic matter. The granular bedding shall be placed in the trench to the widths specified in Section XIV to a minimum depth under the barrel of 150 mm. Granular bedding shall be carefully filled in and hand compacted under and around the pipe and carried up to half the diameter of pipe.

2. CONCRETE BEDS, HAUNCHING AND SURROUNDING

Concrete beds shall be Grade 20 concrete and a minimum of 150 mm thick and of the requisite width specified in Section XIV and shall be finished to the correct gradients. The concrete shall be spread over the floors of the trenches to half the thickness of the bed finally required and this concrete shall be kept clean. In the event of its becoming soiled, it shall be brushed and washed down with clean water immediately before the pipe laying is commenced. As each pipe is laid, the barrel shall be tamped into a dumpling of plastic concrete, to the correct line and level. After the pipes have been jointed, inspected and tested and approved by the Employer's Representative, the remainder of the concrete required to complete the full thickness of the bed shall be worked under and around the pipes. This concrete shall be the full width of the bed and shall be haunched up on both sides to half the diameter of the pipe.

Vertical pipes and other pipes where so required by the Employer's Representative shall be entirely surrounded with Grade 20 concrete 150 mm thick.

3. THRUST BLOCKS

The Contractor shall construct thrust blocks in Grade 20 concrete at all branches and changes of direction as shown on the Drawings.

The thrust faces of all blocks shall be cast directly against sound faces of excavations and the shape and size of the blocks shall be agreed with by the Employer's Representative having regard to the nature of the ground and the load or thrust to be imposed upon it.

7.0 **CHARTS :-**

Valves shall be provided with brass tags numbered. The contractor shall furnish a chart indicating location and service of each valve. The charts shall be framed, set under glass and later, hung where directed by Engineer.

8.0 **CLEANING AND PROTECTION :-**

8.1 All exposed metal surfaces shall be cleaned from dirt, grease and other foreign material. Chrome plated surface shall be polished upon completion of the construction.

8.2 Fixtures shall be protected from damage during construction and shall be cleaned in accordance with manufacturer's instructions upon the completion of construction.

8.3 At the completion of the construction, all surplus material, cartoons, boxes and other debris, shall be removed from the site.

9.0 **TESTS :-**

9.1 Waste pipes shall be tested by being water-filled to the roof.

9.2 Water lines shall be tested by 100 pounds per square inch (7.03 kg. per sq cm) pressure.

9.3 Air lines shall be tested by 200 pounds per sq. inch. (14.06 kg. per sq. cm.) pressure.

9.4 Steam line, before the insulation in installed, shall be tested by 200 pounds per square inch (14.06 kg. per square cm) pressure.

10.0 PIPEWORK - PIPES

10.1 Reference to other sections

General directions and descriptions of materials and work which are included in other sections of this Specification but which also apply to the provision of pipework are not necessarily repeated in this section. Reference should, therefore, be made to the Specification as a whole and not confined to this section.

10.2 Pipelines below ground - inspections

The Contractor shall give notice to the Employer's Representative for purpose of inspection whenever sections of:

a) excavations are completed
b) concrete beds are laid
c) pipework installations are completed and no further work shall be executed until each stage of the work has been inspected.

10.3 Asbestos cement pipes

Asbestos cement pipes shall comply with relevant I.S./ Equivalent 'Asbestos cement pressure pipes'. Pipe joints shall be made using one of the following types of flexible coupling:

a) Rubber ring joint incorporating an asbestos cement sleeve

b) Rubber ring joint incorporating a cast iron or steel spacer and cast iron or steel flanges. Asbestos cement pipes shall be coated internally and externally with bitumen in accordance with relevant I.S. /Equivalent.

10.4 Clay pipes

Vitrified clay pipes to be used for sewerage or surface water shall be manufactured in accordance with the requirements of relevant I.S. / Equivalent complete with flexible spigot and socket connections.

10.5 Ductile iron pipes

Ductile iron pipes shall conform to relevant I.S./Equivalent joints shall be flexible spigot and socket connections. Pipes shall be coated internally and externally with a coal tar pitch or bitumen material as specified in relevant I.S. / Equivalent.

10.6 Steel pipes

Steel pipes shall comply with relevant I.S. /Equivalent.

Diameters and thicknesses of pipe shall be selected from those given unless otherwise approved by the Employer's Representative. Pipe ends shall be prepared for butt welded, sleeve welded, or slip-on coupling joints as indicated on the drawings and in accordance with I.S /Equivalent.

Internal protection shall be spun bitumen with suitable primer, all to I.S.

External protection shall be fiber glass reinforced bitumen sheathing for below ground installation with suitable primer, all to I.S./ Equivalent. For above ground installation the pipe shall have one coat zinc chromate primer and two coats of approved bituminous aluminum paint.

10.7 Galvanized steel pipes

Distribution pipe work for potable water supply shall generally be galvanized steel pipe conforming to I.S / Equivalent having plain ends suitable for screwing to I.S / Equivalent pipe threads.

10.8 Corrugated steel culverts

Corrugated steel culverts shall be Armco Type E.100 bolted nestable culvert or approved equivalent and shall consist of corrugated, galvanized and bitumen coated steel sheets bolted into rings to form a pipe of the required diameter. The corrugations shall have a pitch of 100 mm and a depth of 20 mm.

The steel used in the fabrication of the sheets shall conform to the requirements, of I.S/Equivalent condition HR.

The sheets shall be hot-dip galvanized after fabrication to ensure a coating weight of not less than 755 g/m^2. Where the zinc coating has been damaged by field cutting or other means, the damage shall be made good using an approved zinc-rich paint.

10.9 Pre-cast concrete pipes

Pre-cast concrete pipes for foul and surface water drains shall comply with I.S/Equivalent.

Pre-stressed concrete pipes for pressure pipelines shall comply with I.S/Equivalent.

10.10 Unplasticized P.V.C. Pipe

Unplasticized P.V.C. (U.P.V.C.) pipes for cold water services shall comply with I.S. / Equivalent.'Unplasticized P.V.C. pipe for cold water services'.

Joints shall comply with I.S./Equivalent.

Unplasticized P.V.C. pipes for foul and surface water drains shall comply with I.S./ Equivalent.

10.11 Steel components and bolts

All steel components shall be hot dip galvanized in accordance with I.S./Equivalent 'Hot dip galvanized coatings on iron and steel articles'.

Bolts, nuts and washers shall comply with the following standards:

I.S. / Equivalent 'ISO metric black hexagon bolts, screws and nuts'.
I.S./Equivalent 'Metal washers for general engineering purposes'.

All bolts, nuts and washers are to be zinc coated in accordance with I.S./Equivalent 'Sherardized coatings on iron and steel articles'.

All steel flanges shall comply with I.S./Equivalent.

10.12 Rubber rings and gaskets

Rubber rings and gaskets shall conform with I.S./Equivalent 'Materials for elastomeric joint rings for pipe work and pipelines'.

Dimensions of gaskets shall conform with I.S. / Equivalent 'Dimensions of gaskets for pipe flanges to I.S./Equivalent.

10.13 Temporary storage

The Contractor shall take into temporary protective storage all pipes not required for immediate installation in the Works, or for stringing out along the pipeline.

Pipes in storage shall be laid on wedged timber bearers so as to be at least 75 mm clear of the ground; pipes other than thin shell pipes may be stacked if suitable protective packing is placed between the layers.

The period between taking delivery of a pipe and the completion of its installation shall be kept to a minimum. Any period during which the pipes are laid out along the pipeline or placed alongside the Works awaiting installation shall also be kept to a minimum and if this period exceeds one month pipes shall be raised at least 75 mm from the ground on timber bearers.

10.14 Handling and installation generally

Throughout the construction of the pipeline including the operations of off-loading on delivery, handling, storing, and transporting pipes and valves on or about the Site, the Contractor shall use such methods plant and equipment as will prevent damage to the pipes and to any sheathing lining or paintwork, and such methods shall include the use in appropriate cases of pipehooks, lifting beams, reinforced canvas slings, protective padding, struts, cradles and pipe trailers.

No pipe shall be moved by rolling save over suitable timber planking so arranged as not to damage the pipe or its sheathing.

10.15 SETTING OUT

The Contractor shall set out all drains and services in accordance with the drawings and shall set up and maintain temporary bench marks and shall provide all necessary labour and materials, instruments and boning rods and shall erect and maintain all sight rails. Sight rails shall be set up for all lines of drains, such that there will always be at least three rails in position at one time on each line of pipes, to any one gradient.

The drains shall be laid in straight lines and to even gradients to the levels shown, with pipes and specials of the kinds and diameters shown.

Level pegs shall be accurately boned in from the sight rails and driven into the bottoms of the trenches to the levels of the inverts of the lines of pipes.

10.16 EXCAVATION

The bottoms of all excavations shall be trimmed and consolidated to the correct levels. Unauthorized excavations below the required level shall be filled with material of the same composition as for pipe work beds. Where the bottom is insufficiently firm, the Contractor shall excavate until, in the Employer's Representative's opinion, a firm bottom is obtained and the level shall be made up with material of the same composition as for pipe work beds. Particulars of such additional work shall be agreed with the Employer's Representative before the work is covered up.
The minimum trench width for all buried pipelines shall be 600 mm or as described in the following table:

Pipe dia mm	Minimum Trench Width mm
200	600
225	650
250	850
300	900
400	1 000
450	1 000
500	1 100
550	1 100
600	1 200
650	1 200
750	1 300
900	1 500
1 200	1 800
1 250	1 800
1 400	2 000
1 600	2 000

10.17 PROTECTION OF EXCAVATIONS

The requirements of Section II shall apply equally to excavation for pipe - work.

10.18 LAYING PIPES

All pipes shall be inspected for defects prior to laying. Any damaged pipes shall be rejected.

Pipes shall be carefully lowered into the trenches, and all damaged pipes shall be rejected. Pipes shall be laid truly straight on line and gradient with sockets upstream.

The pipes shall be laid singly on the bed and the level of each pipe shall be tested by a straight edge laid in the invert of the pipe from the invert of the pipe previously laid and on to the nearest level peg. If the bottom of the trench or bed is too low, it shall be made up with the appropriate bedding material.

Care shall be taken to ensure that there is no irregularity to the invert of the joints and the bore of the pipe shall be cleared of any obstruction before the next pipe is laid.

No pipes shall be laid on their collars or on bricks, tiles or other temporary supports.

Where it is required to shorten any pipe, it shall be cut off square and cleanly with approved pipe-cutting equipment. Pipe runs shall be kept free from mud, debris, superfluous cement or other obstructions during laying and until the completion of the Contract. In the event of any pipe being fractured from any cause whatsoever, after having been to all appearances properly laid, the Contractor in every instance will be held responsible and any such defective pipes shall be replaced to the satisfaction of the Employer's Representative.

Where possible pipes shall be laid with not less than 1m cover. If the cover is less than lm or under roads with less than 1.2m cover or where ordered by the Employer's Representative they shall be haunched or surrounded with Grade 20 concrete, minimum thickness 150mm.

10.19 JOINTING OF PIPES

Jointing of pipes shall be carried out strictly in accordance with the manufacturer's instructions.

10.20 WELDING JOINTS FOR STEEL PIPES

Welding of joints in steel pipes shall be carried out manually by the metal-arc process complying generally with the requirements of BS 4515.

In all other respects the requirements for welding set out in Class M shall apply.

10.21 INTERNAL AND EXTERNAL PROTECTION

After completing a joint any protective paint or bitumen lining shall be made good and any steel joint which is not already coated shall be cleaned and coated to the standard specified for the pipes.

The method proposed for making good of lining at the joints shall be submitted for the Employer's Representative's prior approval.

10.22 SLEEVES

All pipes, conduits, cables or the like passing through walls or foundations shall be protected by sleeves of U.P.V.C. pipe.

10.23 BACKFILLING

Where pipes are not surrounded by granular bedding or concrete, the filling around and 300 mm above the pipe shall be of suitable material free from stones which would be retained on 20 mm sieve.

Backfilling of trenches shall be done with suitable material in layers not exceeding 150 mm. The highest possible degree of compaction shall be obtained with the provision that no mechanical rammer will be used within one meter of the top of any pipe.

10.24 TESTING

The Contractor shall provide clean water and all assistance and appliances for testing during the progress of the Contract and for the independent final tests. The Contractor shall give notice of testing to the Employer's Representative. All works shall be tested as described and to the satisfaction of the Employer's Representative before backfilling of the excavations is commenced.

The Contractor shall locate and remedy all defects before further pipe laying proceeds and shall repeat the test until a satisfactory test is obtained. Where a length of pipe under test terminates at a manhole, the restriction on further pipe laying will not apply.

The Contractor shall provide and fix testing branches and bends, as required and shall seal off or remove them as directed by the Employer's Representative.

The Contractor shall ensure that all sections of the pipelines are completely clear of any obstructions, debris and superfluous matter, before any tests are applied to such sections and upon completion of the Contract. Testing of pipelines shall comply with the following as applicable.

(i) Foul gravity drains shall be filled with water under a head of not less than 1,500 mm after the joints have been made and before any backfilling is commenced. After a reasonable period has elapsed, the water level shall be made good by adding water, as required. The water level shall then be maintained for half-an-hour without adding further water.

(ii) Pressure mains shall be subjected to pressure and leakage tests which shall be carried out on all pipelines at the direction of the Employer's Representative. The maximum section of pipeline under test shall be 1,000 meters and joints shall be left uncovered throughout the duration of the hydrostatic test.

Pipelines shall be slowly filled with water such that all air is expelled; after filling, the pipeline should be left under operating pressure for a period agreed by the Employer's Representative, such that conditions as stable as possible can be achieved. Unless agreed in writing by the Employer's Representative, the test pressure shall be 1.5 times the operating pressure at the lowest point of the pipeline section under test. This test pressure shall be applied by means of a pump connected to the pipe, in a manner satisfactory to the Employer's Representative, and shall be held for a minimum of 30 minutes. If a drop in pressure occurs, the quantity of water required to re-establish the test pressure should be carefully measured. This shall not exceed 0.1 liters per millimeter of pipe diameter per kilometer of pipeline per day for each 30 m of pressure applied.

The Contractor shall provide a duplicate certificate test book for pipelines as follows:

(a) Each test certificate shall be consecutively numbered, the top copy of which is retained by the Contractor. The book will remain the property of the Employer's Representative.

(b) Each test certificate will indicate the date of test, location of section under test; pipe diameter; test pressure; test duration; pressure drop (if any) and any other pertinent remarks.

This procedure shall be carried out for each test made whether the outcome of the test is successful or not.

11.0 **PIPEWORK - FITTINGS AND VALVES**

11.1 FITTINGS GENERALLY

Unless otherwise specified all bends, junctions and reducers shall be of the same material and comply with the same I.S. /Equivalent as for the main pipeline.

11.2 ASBESTOS CEMENT PIPE FITTINGS

Bends shall be asbestos cement and comply with I.S../Equivalent.

All other fittings shall be cast iron, generally in accordance with I.S./Equivalent 'Grey iron pipes and fittings', with thickness appropriate to the pressure class. Ends shall be suitable for flexible coupling or flanged. Fittings shall be dipped in bitumen based material as specified in I.S./Equivalent.

11.3 BUTTERFLY VALVES

Butterfly valves shall comply with I.S./Equivalent 'Cast iron and carbon steel butterfly valves' for general purposes.

11.4 SLUICE VALVES

Sluice valves shall comply with I.S./Equivalent 'Double flanged cast iron wedge gate valves for waterworks purposes'. Each valve shall be the same nominal size as the pipe unless otherwise specified, fitted with a spindle cap and arranged for clockwise closure.

11.5 CHECK VALVES

Check valves shall comply with I.S. /Equivalent 'Cast iron check valves for general purposes'. For nominal bore of 500 mm and above they shall be of the tilting disc or double disc type with bolted split casing.

11.6 FIRE HYDRANTS

Hydrants shall comply with I.S. /Equivalent 'Underground fire hydrants and surface box frames and covers'.

11.7 AIR VALVES

Each air valve shall be of the type and size specified. It shall be suitable in all respects for the operating conditions and in the case of a large orifice air valve or air valves incorporating a large orifice, it shall be designed to prevent valve closure when discharging large quantities of air. Each valve is to be complete with an isolating valve to allow removal of the air valve under operating conditions.

11.8 PROTECTIVE COATINGS

All valves shall be coated internally and externally with bitumen solution to I.S/Equivalent.

11.9 FLANGES AND GASKETS

All flanges shall be to I.S. / Equivalent 'Flanges and bolting for pipes, valves and fittings' unless otherwise specified. Gaskets shall conform to I.S./Equivalent.

11.10 SLIP ON TYPE COUPLINGS

Slip on type couplings, stepped couplings and flange adapters shall be 'Viking Johnson' (V.J.) or similar approved. They should be the proper model for the pipe with which they are to be used and be supplied with central register (standard couplings only), galvanized bolts, and tapped plugged holes (for application of internal extensive coating).

In jointing plain ended pipes with couplings the Contractor shall take account of the manufacturer's recommendations as to the methods and equipment to be used in assembling the joint. In particular

the Contractor shall render the end of each pipe perfectly smooth so as to allow the joint sleeve to slide freely and where necessary shall re-coat the pipe ends with two coats of quick drying bituminous solution.

If the internal diameter of the pipe is 500 mm or more the coupling shall be sealed internally after completion. A temporary flexible internal backing strip coated with mould whiting shall be fitted inside the pipe to seal the cavity between the pipe ends and the joint sleeve and funnels shall be screwed into the plug holes in the V.J. coupling. Hot bitumen compound shall be poured in through the lower plughole (the upper funnel acting as an air vent) until the cavity is full. After the bitumen has cooled the backing strip and funnels shall be removed and the screw plugs replaced.

Where the couplings are used for below ground installation they shall be cased in bitumen using a proper mould supplied by the coupling manufacturer, into which hot bitumen compound shall be poured as for the internal lining.

11.11 INSTALLATION OF VALVES

Valves shall be installed in the Works as shown on the Drawings or directed by the Employer's Representative. Installation of valves shall include installation and fixing of any operating gear and associated fittings.

Before installing valves the Contractor shall tighten all loose nuts and bolts on the valves and associated equipment and shall ensure that they are watertight and in proper working order.

Flanged joints shall be made with steel bolts and nuts which shall include two washers per bolt. All nuts shall first be tightened by hand and nuts on opposite sides of the joint circumference shall then be alternately and progressively tightened with a spanner so as to ensure even pressure all round the joint.

After installation valves shall be cleaned inside and out, any protective coating made good, and shall be left in the closed position.

11.12 FERRULES

Ferrules for connecting service pipes to water mains shall be of non-ferrous metal fitted by clockwise screwing down. The nominal diameter of a ferrule shall not exceed one quarter of the nominal diameter of the main into which it is inserted. The ferrule shall be screwed into the main at an angle of 90 degrees to the vertical and the outlet shall be directed along the main so that the service pipe leads off with a right angle turn away from the main.

11.13 DRILLING AND TAPPING MAINS

Tappings in pipes shall be made by first fitting a purpose-made saddle on the main with wedges, bolts and rubber washers or other equally effective device. Using a sharp drill a hole shall then be drilled slowly through the boss of the saddle piece and through the barrel of the pipe and the hole shall be tapped to give a continuous thread through the saddle and the pipe.

12.0 **PIPEWORK - MANHOLES AND PIPEWORK ANCILLARIES**

12.1 MANHOLES

Manholes shall be precast concrete to I.S. /Equivalent or of blockwork or brickwork construction. The design shall generally comply with recommendations in I.S./Equivalent.

Blockwork or brickwork walls shall be constructed such that joints shall be well flushed up with mortar leaving no internal voids, flush-pointed on the inside of the manhole and weather-pointed on the outside. Cement rendering of the inside surface of the walls shall consist of two coats of equal

thickness, and the total thickness shall be 12 mm. The surface to be rendered shall be thoroughly cleaned and scored to form a key and moistened with water twenty-four hours before commencement of work. The surface of the first coat shall be similarly roughened to form a key for the second coat, which shall not be applied until the first coat has thoroughly set. The second coat shall be applied within three days of the first coat and shall be floated to a smooth, even surface.

The base of the manhole shall be mass concrete Grade 20 of minimum thickness 150 mm below the pipes.

The channel may be formed using half-pipes or constructed in concrete. It shall be a smooth transition between the inlet and outlet pipes. Pipe soffits shall be kept level when there is a change in pipe diameter. Benching shall have a minimum slope of 2 in 5 towards the channel and shall be rendered to a smooth, hard finish. Particular care shall be taken to provide a water-tight joint where pipes enter and leave the manhole and a flexible joint shall be made 500 mm from the manhole wall. The center lines of pipes shall intersect at the center of the manhole.

Step irons shall be securely grouted 150 mm into the wall. After the grout has hardened each step iron shall be struck a hard blow with a 2 kg hammer and any rung which is broken shall be cut out and replaced.

12.2 MANHOLE COVERS, SURFACE BOXES AND GRATINGS

Cast iron and cast steel manhole covers and frames shall conform to I.S./Equivalent, surface boxes, valve covers and the like shall comply with I.S./Equivalent.

Two sets of each type of key for locking covers and gratings shall be provided and handed over to the Employer's Representative on Contract completion.

12.3 RODDING WAY COVERS

The access to all rodding ways shall be covered by a cast iron cover fixed to a frame with at least two screws and sealed with a composition gasket.

12.4 SEPTIC TANKS

Septic tanks shall be constructed in accordance with I.S./Equivalent.

The septic tank effluent shall be piped to a soakaway the size of which shall be agreed with the Employer's Representative from approved seepage trials to be completed by the Contractor.

13.0 COPPER WATER TUBES AND FITTINGS

Copper "domestic" water pipes shall conform with I.S./Equivalent solid drawn, supplied in straight lengths, suitable for connection by means of compression fittings and capillary fittings, which shall conform to I.S./Equivalent.

14.0 U.P.V.C. TUBES AND FITTINGS

U.P.V.C. waste and overflow pipes to cisterns and geysers shall conform to I.S./Equivalent all erected strictly in accordance with the manufacturer's instructions, using solvent welded joints.

15.0 **EFFLUENT TREATMENT LAGOONS**

Specification:

The Tenderer shall provide the design of an effluent treatment facility and all equipment, piping and instrumentation necessary to treat all liquid effluent discharged from the factory. Civil works and erection form part of the contract scope.

Effluent from the factory shall be discharged at an average rate of 80 t/h and have a typical BOD_5 strength of 1000 to 1500 mg/l. The effluent treatment facility shall yield a final treated effluent with BOD_5 strength no greater than 50 mg/l. The treated effluent shall be discharged to an adjacent waterway that ultimately drains to the local River.

Factory floor washings and evaporator tailings shall be transferred in factory floor drains to an effluent sump and grease trap. The effluent shall be pumped across a curved longitudinal slotted screen to the factory effluent treatment facility.

Shallow ("facultative") ponding or lagoon systems of 1.0 to 1.5 meter depth are preferred for the treatment of liquid effluent. Other processes will be considered except those that incorporate deep anaerobic lagoons.

A number of pond/lagoons, typically four, should be operated in series. Design shall minimize short-circuiting and formation of stagnant zones within the ponds. A mean residence time typically of six to nine weeks should be provided.

It is preferred that mechanical aeration is not used in the effluent treatment facility.

COMPOSTING AREA

A six (6) hectare asphalt, rock cement or concrete pad will be required for the composting operation. The composting area will accommodate 17 rows of compost, 5.49 meters width by 300 meters length. The space between windrows will be 2.44 meters, with a space of 13.42 meters from the outside windrows to the edge of the pad and 30 meters from each end of the windrows to the edge of the pad. The perimeter of the pad shall include a drainage canal to collect the run off from the composting area for recycling.

CONCENTRATED STILLAGE HOLDING LAGOON

The concentrated stillage pumps located in the distillery will pump the concentrated stillage to a holding lagoon, with a volume of 8,400 cu. meters to hold 30 days production of 280,000 liters/day of concentrated stillage. The lagoon shall consist of two compartments to allow the solids that settle out, of the concentrated stillage to be removed periodically.

STILLAGE SPRAY PUMPS – 2 UNITS

The stillage spray pumps shall be used to transfer the stillage from the Lagoon to the composting area for spraying onto the windrows by the compost turner machine.

COMPOST AREA DISTRIBUTION PIPING – 1 LOT

An underground distribution system shall be installed in the composting area, with outlet valves located in various chambers located between the windrows. Each outlet valve will have quick release couplings for connection to a hose with the opposite end of the hose connected to the spray system on the windrow turner machine for spraying onto the windrow. The chambers shall be spaced as required to allow manual movement of the hoses. When the windrow machine reaches the limit of the first hose, it is disconnected and the hose from the next chamber is connected to the windrow machine and the spraying operation is continued. This operation is repeated for each windrow.

MONITORING EQUIPMENT – 1 LOT

A set of computerized monitoring equipment shall be provided that will allow the operators to determine when to turn the row, add the stillage spray and to establish the C:N ratio.

CONSTRUCTION SPECIFICATION
FOR
ROADS AND PAVINGS

SECTION XV

1.0 ROADS AND PAVINGS

1.1 REFERENCE TO OTHER SECTIONS

General directions and descriptions of materials and work which are included in other sections of the Specification but which also apply to the provision of roads and pavings are not necessarily repeated in this section. Reference should, therefore, be made to the Specification as a whole and not confined to this section when dealing with this part of the Works.

1.2 STRIPPING

The areas shall be stripped of all top soil, which shall be deposited evenly in the adjacent fields. All roots, tree stumps, rocks and waste material shall be loaded and carted to tip.

1.3 SUBGRADE AND IMPROVED SUBGRADE

Unless otherwise specified or required by the Employer's Representative, materials forming the direct support of the pavement shall comply with the following requirements:

- CBR (100% I.S./Equivalent - 4 days soak) : minimum 5%
- Swell (100% I.S. /Equivalent - 4 days soak) : maximum 2%
- Organic matter (percentage by weight) : maximum 3%

Where, in the opinion of the Employer's Representative, material unsuitable for the direct support of the pavement occurs in cuttings, the Contractor shall excavate it to the depths and widths required and replace it with selected fill material to form an improved sub-grade.

1.4 LAYING AND COMPACTING SUBGRADE

The maximum compacted thickness which shall be laid, processed and compacted at one time shall be 300 mm.

The layer shall be scarified, water shall be uniformly mixed in or the material allowed to dry out to the correct moisture content.

The upper 300 mm of the earthworks (that is to say the sub-grade) shall be compacted to a dry density of at least 100% MDD (Standard Compaction) in cuttings where there is no improved sub-grade and everywhere in fills and embankments.

In cuttings, where an improved sub-grade is to be placed, the upper 150 mm of the sub-grade prior to the placing of the improved subgrade layer(s), shall be compacted to at least 100% MDD (Standard Compaction) and the lower 150 mm shall be compacted to at least 95% MDD (Standard Compaction), unless otherwise specified.

All improved sub-grade shall be compacted to a dry density of at least 100% MDD (Standard Compaction) for its full depth.

The moisture content shall be adjusted in order that the above minimum compactions are obtained. Unless otherwise accepted by the Employer's Representative, the moisture content at the time of compaction shall not exceed 105% of the Optimum Moisture Content (I.S./Equivalent).

1.5 FORMING OF SUBGRADE

During the above process, the final surface of each sub-grade layer shall be graded to level, parallel to the crossfall and camber and profile shown upon the Drawings or required by the Employer's Representative and to the Tolerances specified in 13 0 - Section XV.

The sub-grade shall be cleaned of all foreign matter and any potholes, loose material, ruts, corrugations, depressions or other defects which have appeared in the sub-grade layer, due to improper drainage, traffic or any other cause, shall be corrected. If required by the Employer's Representative, the Contractor shall scarify, grade and recompense the sub-grade to line, level and specification.

No work above the subgrade shall be executed until the sub-grade has been approved by the Employer's Representative.

Fill for sub-grade or improved sub-grade shall, wherever suitable, be excavated material obtained from drainage ditches and road cuttings.

1.6 DRAINAGE OF WORKS

All cuttings, embankments and borrow areas shall be kept free of standing water and drained during the whole of the construction.

Should water accumulate on any part of the earthwork either during construction or after construction until the end of the Maintenance period, the Contractor shall remove and replace any material which, in the opinion of the Employer's Representative, has been adversely affected.

The Contractor shall so order his construction programs that the construction of culverts and drains does not lag behind the earthworks. Well in advance of commencing earth-moving operations over swampy or waterlogged areas, the Contractor shall cut drains and ditches and carry out any other works as necessary to assist in draining the ground.

All drains and ditches shall be maintained in proper working order throughout the duration of Contract.

The Contractor shall allow in his rates for draining the earthworks satisfactorily at all stages during the construction and arrange his methods and order of working accordingly.

1.7 DRAINAGE DITCHES

Drainage ditches, shall be shaped by excavating to the lines, slopes and widths shown upon the Drawings and finished off so that the sub-grade levels and camber of super elevation of the sub-grade, level and cross fall of the shoulders and slope and invert levels of the side ditches are everywhere in accordance with the Drawings or as required by the Employer's Representative.

1.8 PAVEMENTS GENERALLY

The term "gravel" used throughout this section shall be deemed to include lateritic gravel, quartzitic gravel, calcareous gravel, some forms of weathered rock, soft stone, coral rag and conglomerate.

"Graded crushed stone" shall mean crushed stone, with a smooth grading curve, which is within a specified envelope.

A "gravel" base shall be made up of one of these natural gravels, or of a combination of them, or of a combination of gravel and sand, without the adding of any stabilizing agent.

A "gravel wearing course" shall mean a top surfacing course made from one, or from a combination of materials and may be applied to some or all of a new road formation where no pavement and final bituminous surface is included in the Contract.

A "crushed stone wearing course" shall mean a top surfacing made from graded crushed stone and may be applied to road base course where no final bituminous surface is included in the Contract.

A "surface dressing" shall mean a top surfacing of bituminous binder and stone chipping applied to the road base course.

1.9 MATERIAL FOR GRAVEL BASE AND WEARING COURSES

Unless otherwise required by the Employer's Representative, the Material shall comply with the following requirements:

Gravel For	Base	Wearing Course
Plasticity Index	5-15	5-25
Los Angeles Value – Maximum	70	50
Aggregate Crushing Value – Maximum	50	35
CBR (95% MDD Heavy Compaction 4 days soak) – Minimum	30	80

The grading curve of the material, after processing and compaction shall be of a smooth curve within the following envelope:

	Percentage by Weight Passing	
Sieve Size (mm)	Base	Wearing Course
50	100	-
37.5	95-100	100
20	60-100	95-100
10	35-90	65-100
5	20-75	45-85
2	12-50	30-68
1	10-40	25-56
0.425	7-33	18-44
0.075	4-20	12-32

1.10 MATERIAL FOR CRUSHED STONE WEARING COURSE

The material shall consist of crushed stone, free from clay, organic or other deleterious matter and have the following properties:

(a) Los Angeles Abrasion Value - Max. 40

Aggregate Crushing Value - Max. 30

(b) Grading: The grading curve of the material, after processing and compaction, shall be a smooth curve within the following envelope:

Sieve Size (mm)	Percentage by Weight Passing
37.5	100
20	65-95
10	40-70
5	30-55
2	20-40

1	15-32
0.425	10-24
0.075	-

(c) Cleanliness and plasticity: The fines passing 0.425 mm shall be non plastic.

(d) Crushing, screening and mixing: Unless otherwise required by the Employer's Representative, crushing shall be done in at least two stages.

The screening and proportioning of materials, and their subsequent mixing shall be carried out using such methods and machines as may be approved by the Employer's Representative.

Where the graded crushed stone is deficient in fine aggregate and, in the opinion of the Employer's Representative, the Contractor has made every reasonable effort to produce the required grading, the Employer's Representative will allow admixing of approved non-plastic fine aggregate such as sand or crusher-dust. No extra payment will be made for providing and mixing of such fines.

Where the addition of fine aggregate is necessary, it shall be thoroughly mixed in with the crushed stone. The percentage of fine aggregate to be added to the crushed stone will be agreed with the Employer's Representative and shall in any case not exceed 15 per cent by weight of mixture.

1.11 ORDER OF WORK

Unless otherwise required by the Employer's Representative, the base or wearing courses shall be laid starting as close as possible to the Materials Site and working away from it so that the maximum amount of compaction is given to the wearing course by the Contractor's vehicles, and the Contractor shall route his vehicles to give even wear and compaction over the whole width of the wearing course.

Where black cotton or other high-swelling material, is used in the sub-grade layer, the Employer's Representative may require the Contractor to place wearing course material upon this section immediately after it is compacted and the Contractor shall allow in his rates for doing so.

1.12. LAYING AND COMPACTING BASE AND WEARING COURSES

The base or wearing course materials shall be deposited and spread in a uniform layer across the full width required so that the final compacted thickness is nowhere less than shown upon the drawings or required by the Employer's Representative.

The compacted thickness of any layer laid, processed and compacted at one time shall not exceed 200 mm and where a greater compacted thickness is required, the material shall be laid and processed in two or more layers.

The materials shall be broken down so that the maximum size of any particle is not greater than specified. This may require a grid, cleat or sheepfoot roller or a pulverize and the Contractor shall allow for such processing in his rates.

Any oversize material which cannot be broken down to the required size shall be removed and disposed of as required by the Employer's Representative.

The layer shall then be scarified and water shall be uniformly mixed in, as approved by the Employer's Representative. It shall be graded, compacted to a dry density of at least 95% MDD (Heavy Compaction), and graded to final level.

The moisture content shall be adjusted so that the minimum compaction is obtained. Unless otherwise approved by the Employer's Representative, the moisture content at the time of compaction shall be between 80 and 105% of the Optimum Moisture Content (Heavy Compaction).

1.13 GEOMETRIC TOLERANCES OF PAVEMENT AND SUBGRADE

The pavement layers and the sub-grade shall be constructed within the tolerances shown in the table below.

Levels:

The levels of pavement layers and subgrade shall be determined from the specified surface of the wearing course, calculated from the carriageway vertical profile and crossfall, as shown on the Drawings.

For checking compliance with the table, measurements of surface level shall be taken at 20 m intervals along the center-line and along a line parallel to the center-line but 500 mm from the edge of the layer. At junctions, the spacings shall be as described in the Contract.

Pavement widths:

The half width shall be measured from the centerline of the road to the edge of the layer.

The final average width of all kinds of wearing courses, binder courses, bases and sub-bases measured at six points taken at 20 m intervals over a length of 100 m shall be at least equal to the width specified or ordered.

Crossfall:

The crossfall of the pavement shall nowhere vary by more than 1.0% from the specified value.

Pavement Thicknesses:

In addition to the above tolerances, the thickness of any pavement layer shall nowhere be less than 90% of the specified thickness.
The final average thickness of all kinds of wearing courses, binder courses, bases, sub-bases and shoulders over a length of 100 m shall be at least equal to the thickness specified or ordered.

		Variations Permitted (mm)		
Layer	**Level**	**Irregularity (under 3m straight edge)**	**Half Width**	**Half Width Maximum Variation in 20 m**
Subgrade	-40,+25	N.A.	N.A.	N.A.
Base	-30,+25	+/-25	-50,+100	N.A.
Surface Dressing	N.A.	N.A.	+/-25	30
Shoulder	+/-15	+/-15	N.A.	N.A.
Gravel Wearing Course	+/-25	+/-25	-25,+50	50
Crushed Stone Wearing Course	+/-25	+/-25	-25,+50	50

1.14 SURFACE DRESSING

(a) Primer:

The prime coat shall be a low viscosity medium curing cut-back bitumen (MC-30 or similar approved) sprayed uniformly over the road base at a rate of between 0.5 L/m^2 and 1.0 L/m^2 as approved by the Employer's Representative.

(b) Binder:

After a period of not less than 24 hours the primed surface shall be sprayed uniformly with a medium curing cut-back bitumen (MC-3000 or similar approved) at a rate between 0.9 L/m^2 and 1.5 L/m^2 as approved by the Employer's Representative.

(c) Chippings:

Chippings shall be spread uniformly onto the binder and rolled with an approved pneumatic-tyred or steel wheeled roller. The chippings shall be single sized crushed stone as cubical as possible and free from visible stone dust and deleterious substances such as clay, salt, or organic matter. The nominal size of chippings shall be in the range 6 mm to 15 mm as approved by the Employer's Representative.

1.15 USE OF SURFACES BY CONSTRUCTIONAL TRAFFIC

Constructional traffic used on pavements under construction shall be suitable in relation to the courses it traverses so that damage is not caused to the sub-grade or the material constructed.

The wheels or tracks of plant moving over the various pavement courses shall be kept free from deleterious materials.

Bituminous basecourse material shall be kept clean and uncontaminated for so long as it remains uncovered by a wearing course or surface treatment. The only traffic permitted access to basecourse material shall be that engaged in laying and compacting the wearing course or, where the basecourse is to be blinded and/or surface dressed that engaged on such surface treatment. Should the basecourse become contaminated the Contractor shall make good by cleaning it to the satisfaction of the Employer's Representative and if this proves impracticable, by removing the layer and replacing.

1.16 CONCRETE ROADS

Concrete roads shall be laid on a sub-grade of compacted fill as detailed in Clause 1.12 – Section XV. Levels of the finished layer shall permit the full minimum thickness of concrete slab to be constructed at all places.

The sub-grade shall be thoroughly wetted before placement of the concrete.

Concrete road slabs shall be constructed using Grade 20 concrete having a minimum thickness of 200 mm.

Reinforcing layers are required at the top and bottom of the road using 10 mm dia. mild steel reinforcing bar at 200 mm centers both ways. These layers shall be fixed and supported in place before the concrete is poured and there should be a minimum concrete cover over all steel of 50 mm.

All construction and expansion joints shall be as indicated on the drawings with the following maximum spacings, 60 meters (expansion joints), and 20 meters (construction joints).

Surface slopes shall be as indicated on the drawings and the finish shall be type U1, as per Table 2. Permissible tolerances for various types of finish presented at the end of Clause 1.12 – Section XV,

screeded off and left with a uniform ridged surface (not trowelled). The tolerances on finished road levels shall comply with that of the wearing courses in the table indicated in Clause 1.13 – Section XV.

CONSTRUCTION AND TECHNICAL SPECIFICATION FOR LANDSCAPING, ARBORICULTURE AND RAINWATER HARVESTING WORKS

SECTION XVI

GENERAL INSTRUCTIONS AND SPECIFICATIONS

1.1 SCOPE OF WORK:

The landscape contractor shall from the date of commencement of contract,furnish all materials, labour, and related items necessary to complete the workindicated and specified herein.
The scope of work for the above mentioned work shall include following andshall be carried out as per BOQ, Specification & Landscaping Layoutdrawings:
1. Green belt plantation
2. Avenue Road Plantation
3. Lawns
4. Median Plantation
5. Road Side Plantation
6. Indoor Plantation Works for Admin Building along with decorativepebbles.
7. Providing planter R.C.C. Planter beds, R.C.C. Urns.
8. Static Water fountain with all necessary civil works
9. Pathways with UNDRESSED GREY GRANITE paving slabs
10. Sprinkler system for lawns

The landscape contractor will be generally responsible for the entire site butin particular to works listed below. Along with site management, theresponsibilities will include landscaping works and arboriculture works andmaintaining the same. Total landscaped and arboriculture plantation worksarea is as shown on the drawings.

The Landscape contractor should have or shall set up their office at site for effective dealing with client and the consultant.After planting, all planted areas that have exposed soil will have to bemulched with straw or hay. Mulching will be evenly spread to cover anyexposed soil.

In addition, the contractor will also be responsible for filling gaps, thinning andtransplanting, or replanting where plants may need to be replaced. Along withother planting, the contractor will also be responsible for improving soilconditions for planting. This may include import /export of sand/soil to/fromsite. The contractor will also clear vacant area from existing grasses, keepthe site clean and maintain the already planted areas free of weeds, pests orwill be cleared up to 1000mm from the edge of planting of newly created andalready existing horticultural works (such as boundary trees). The contractorwill also be responsible for protection of the plants from salt spray that mayoccur during the monsoons.

1.2 STORAGE SHED:
No storage area will be provided at site by the Employer. As mentioned inGeneral Conditions of Contract, security of materials at site will be theresponsibility of the contractor. Any temporary sheds or structures may bebuilt as working space at the area shown at site and on the approval of the Consultant Site Engineer.

1.3 WATERING:
Water will be made available at only one source at site. If the water on site isinsufficient or saline or unacceptable, then the contractor shall be responsiblefor importing water in water tankers for the general upkeep of the plants. Noplants shall be allowed to wither or die due to lack of proper watering.

1.4 REPLACEMENT OF PLANTS:

Those plants that are not up to the standards, and do not meet specificationsshall be replaced by the contractor at no extra cost to the Employer.
When the plants are to be replaced either for filling gaps or poor quality, thenthe contractor shall replace with plants of equal height , size and age of theplants in that area. For this purpose, extra numbers of plants of those used inthe project will have to be maintained in the Nursery.
The contractor shall be responsible for any thefts of plants already planted.
While the Employer will provide security at entry and exit points, plantsremoved by theft shall be the responsibility of the contractor.

1.5 PLANT REQUIREMENTS:
Plants and shrubs shall be sourced by the contractor from available nurseries,unless otherwise specified. Seeds shall be acquired from reputedorganisations and hybrid seeds will be used where possible – particularly forflower varieties. No plant material shall be changed without the consent of theConsultant.

1.6 WEEKLY REPORT:
The contractor shall also maintain a work report for work completed eachweek. The same report in English, will be sent to the Consultant / Engineer InCharge. The Consultant / Engineer In Charge shall verify completed work asper the report. Contractor will be responsible for meeting deadlines for thecompletion of the job.

1.7 RESPONSIBILITY:
a) The contractor's work shall not hinder other work, either underground orover ground, such as electrical, phone lines, water or sewage lines, etc. Inareas of overlap, the contractor shall work in coordination with otherrelated contractors. Any damage by the landscape contractor's team tosuch utilities will be penalized and contractor shall be responsible for costfor such damages.
b) The contractor shall abide by the Security rules / procedures of theEmployer, and shall obtain gate pass, issue I.D. badges to all theiremployees on site, etc. as prescribed by the Employer.

1.8 MATERIALS & LABOUR:
All the materials which are required for the progress of the Landscaping worksshall be supplied by the contractor. The required numbers of Labour are to beprovided by the contractor.

1.9 PLANTING:
Whenever planting, the following specifications will be followed by the contractor. Wherever sand is to be removed, the following specifications shall be followed after refilling the area with good soil.

1.10.1 DIGGING OF PITS:
Tree pits of 600mm x 600 mm x 600 mm (approx. 2'x2'x2') shall be dug aminimum of two weeks prior to back filling. The pits for shrubs shall be 600mm in depth and 300mm diameter. For ground cover, the land will beprepared by digging up to 300 mm (1') and soil loosened. While digging thepits the top soil may be kept aside, and mixed with the rest of the soil asspecified.

If the soil quality is poor, it shall be replaced with soil mixture acceptable tothe Consultant. If the soil quality is satisfactory, then it shall be mixed withmanure and river sand. The soil condition will have to be approved by theConsultant. Pest/termite prevention chemicals or any other approvedchemical to be applied into the soil before planting as per supplier'sspecification.

When planting is in more than one row, then pits will be dug in a zig-zagfashion ensuring a diagonal planting in each row.

1.10.2 PLANTING MIXTURE:
The topsoil will be mixed with 15% farm yard manure or coco-peat, 40% redsoil, 20% river sand and 20 % excavated earth (topsoil). This mixture will befilled in pits before and after planting.

1.10.3 BACK FILLING:
The soil is back filled, watered thoroughly and gently pressed down a dayprevious to planting, to make sure that it may not further settle down afterplanting.

1.10.4 PLANTING:
No tree pits shall be dug until a final tree position has been pegged out forapproval. Care shall be taken that the plant sapling when planted is notburied beyond the level of the pot containing it. Planting should not be carriedout in waterlogged soil.

1.10.5 STAKING:
If necessary, a single vertical stake 1 meter (approx. 3 ft) longer than the clearstem of the plant, driven 300 mm to 450 mm (approx.1ft to 1'6") into the soilshall be used. Each plant should be secured to the stake so as to preventexcess movement

1.10.6 WATERING:
The landscape contractor shall allow for the adequate watering of all newlyplanted trees, shrubs and groundcover immediately after planting and during the following growing season, shall keep the plant material well watered.

1.10.7 MULCHING:
All planted areas including around trees which have open soil that is exposedwill have to be mulched with straw or hay. Rates indicated in the Bill of Quantities shall include such mulching costs. No separate compensation will be paid for mulching.

1.10.8 PLANTING ALONG THE EDGE OF THE BUILDING:
All plants proposed to be planted by edge of building in front façade of building should be planted with special care so as to ensure the following:
a) The painting/cladding of walls is not soiled and kept clean at all times
b) Watering is done with care so as to ensure water is not entering windows or muddy water is not splashed on walls.
c) All plants growing over the height of windows should be trimmed below window height.

1.10.9 PROTECTION:
The contractor will be responsible and should take measures to protect the planted saplings from cattle, salt spray and high wind pressure. Rates indicated in the Bill of Quantities shall include such costs of protecting the plants including any physical construction such as walls, tree guards, etc. that may be required for the same.

1.11 SHRUB PLANTING & GROUND COVER:
Same specification as for trees, except where specified otherwise

1.12. LAWNS:

1.12.1 PREPARATION:
During period prior to planting the lawn, the area shall be maintained freeform weeds, whatever the nature of soil, complete surface shall be trenched over to a depth of 300 – 450 mm. Grading and final levelling of the lawn shallbe completed at least 2 weeks prior to the actual sowing.

1.12.2 SOIL:
The soil itself shall be ensured to the satisfaction of Consultant to be a good fibrous loam, rich in humus. Pest/termite prevention chemicals to be mixed if required. Top soil shall be mixed with farm yard manure or coco-peat and mixed with river sand in ratio of 15% manure, 25% river sand, 35% red soil and 25% excavated earth and levelled to maintain positive drainage or specified slopes.

1.12.3 EXECUTION:
Nodes of specified grass shall be dibbled not more than 50mm apart onabove mentioned soil conditions. Wherever specified, carpet lawn will used.
The carpets will be laid next to each other in an even pattern to ensure that alllawn area is covered. After laying of carpet, it should be lightly pressed intothe ground to ensure that it is does not shift, and to ascertain that the rootsare in soil. Positive slopes will be maintained to ensure that there will be nolow lying areas in center where water logging or pools are created.

1.12.4 MAINTENANCE:
In the absence of rain, lawn shall be watered daily - heavily, soaking the soilthoroughly to a depth of at least 150 mm.

1.12.5 CUTTING:
The scythe must continue to be used for several months until the grass issufficiently secure in the ground to bear the mowing machine.

1.12.6 EDGINGS:
These shall be kept neat and must be cut regularly with the edging shears.

1.12.7 FERTILIZING:
The lawn shall be fed once a month with liquid fertilizer by dissolving 45 gmsof Ammonium Sulphate in 5 litres of water.

1.12.8 WEEDING:
Prior to regular mowing, the contractor shall carefully remove unsightlyweeds.

1.12.9 MODE OF PAYMENT:
The payment for the lawns shall be paid in stages as mentioned below.

Stage – I
Clearing of debris and removal of top layer of Fly ash / Top Soil to about 300mm depth in the area where lawn is to be planted.

Stage - II
After enriching and filling the top layer of soil with a mixture of Red soil, farmyard Manure, river sand etc as mentioned in the specifications or as directedby engineer in charge.

Stage - III
After the completion of weeding or fixing of carpet lawn as specified indrawing or instructions of Engineer in charge.

MAINTENANCE:
PRICE SCHEDULE FOR ANNUAL MAINTENANCE CONTRACT (AMC) FOR APERIOD OF ONE YEAR:
Tenderer shall indicate the price schedule for annual maintenance contract for a periodof 1 (one) year after the expiry of one year 'Defects Liability period' (guarantee period) inthe following format. Charges shall be indicated for 1 (one) year after the expiry ofguarantee period. However, payment shall be made on quarterly basis.
Maintenance:
Maintenance of all items as per BOQ for a period of 1 (One) year after the expiry of oneyear defects liability period.
Stone slab work:
This specification relates to the requirement of furnishing of materials for and installationof stone slab works. The types of work that are mainly intended under this head are:
- Dressed granite slab work; marble slab work;
- Limestone/ thandur/ cudappah slab works in flooring; and
- Wall facings and finishes in counters/platforms with polished granite slab, marble slab,limestone and/or cudappah slabs.

A. REFERENCE TO STANDARD SPECIFICATIONS:
IS: 1805... ..Building Stones: occurrence, quarrying, dressing and glossary ofterms related to;
IS: 1129..... Dressing of natural building stone;
IS: 1127..... Dimensions and workmanship of natural building stone;
IS: 1443..... Laying and finishing of cement concrete flooring tiles
B. MATERIALS:

The stones shall be best quality available in the locality, and of specified colour suchas black, pink, grey etc The stones shall stand weathering well, and when immersedin water for 24 hours, shall not absorb more water than 5% of its dry weight whentested according to IS:1124. All stones shall generally be freshly quarried. They shallnot have any streaks or flaws, and shall be free from dirt, dust, oil or any other
unwanted matter, that may prevent adhesion of mortar or be otherwise harmful to thework. Particular attention shall be paid to uniformity of colour and matching patterns.
The thickness of stone slab, after dressing, shall be around 5 cm, and in no caseshall exceed 15cm.

C. DRESSING:

The edges of stone slabs may be rounded or chamfered, and the dressing of stoneslab surfaces and sides may be either or of the following:

i) Rough dressed- the stone surface shall be chisel dressed to one plane, removingall bushings so that the maximum depression is not more than 6mm.

ii) One-line dressed- this is done after the rough-dressing is completed by pointchiseling so that the variations are not more than 4mm. Work includes roughdressing

iii) Two-line dressed- this is done after the one-line dressing is completed by pointchiseling so that the variations are not more than 25mm. Work includes roughdressing and one-line dressing.

iv) Three line dressed- this is done after the two-line dressing is completed by pointchiseling so that the variations are not more than 15mm. Work includes roughdressing, one-line dressing and two-line dressing.

v) Palmane dressed- after the three-line dressing is over, the surface issmoothened by using a special palmane tool to further even out the three-linedressed surface, so that the maximum variation in surface plane is not more than1.0mm. Work includes rough dressing, one-line dressing and two-line dressingand three-line dressing.

vi) Polished- the stone surface is polished by grinding using manual or mechanicalprocess to give a smooth, even perfect plane surface, or as directed. The polishedsurface should reflect light like a mirror, and must be free from scratches anddepressions.

The stone slabs used shall be dressed and their edges finished as shown in thedrawings, or as directed by Architect/Engineer.

D. MODE OF MEASUREMENT AND PAYMENT:

Stone slab work shall be measured net in square meter, i.e. plan area of flooring,counter slab, platform slab, treads etc., and area in elevation for facings, risers etc.

Slabs used as elements in themselves shall also be measured in area in squaremeters.

The quoted rate shall include the supply of all materials, tools, tackles, labour etc.,the dressing, polishing and cleaning of the slabs, and their laying, fixing in positionand curing.

PAVING AND FLOORING WORK:

This specification refers to the furnishing of materials for and laying of paving ofvarious types.

STONE-SLAB PAVING:

The stone used shall be shahabad, thandur, kotah, cudappah, sira or any otherstone as shown on the drawings or approved by the Consultant/Engineer. The slabsshall be of selected quality, hard, sound, dense, homogeneous in texture, free fromcracks, decay, flaws, weathering, and of specified thickness. The top exposedsurface should have been roughly polished before bringing to site, unless otherwisespecified. Unless otherwise specified, the slabs should be cut to the required shapeand size, either by hand using a fine chisel or machine cut, as specified. All piecesshould be of uniform size.

If the paving is to be laid on concrete, a layer of cement mortar 1:6 shall be laid onthe concrete bed, and properly levelled to an average thickness of 20 mm. Thesurface should be kept slightly rough so as to form a satisfactory key for the stoneslabs. Wet cement paste of honey-like consistency shall be spread over mortar bed,over such an area so that the paste will not harden before laying tiles. Slabs shall besoaked in water for 15 minutes and allowed to dry. The slab shall than be fixed asper approved pattern, with a thin coat of cement paste at the back of each slab Thestone slabs shall be tapped with a wooden mallet till it properly bedded in level withadjoining slabs. Joints shall not be more than 1:5 mm wide. The surplus cementgrout that may have oozed out of the joint shall be wiped off gently and the jointscleaned. The joints shall be filled up with grey or white cement or with an admixtureof pigments to match the colour of the slab, as directed by the Consultant. Thepaving shall be cured for at least fourteen days. After that, it shall be polishedaccording to IS: 1443, except that cement slurry shall not be applied beforepolishing, and first polishing with coarse grade carborandum shall not be done.

TECHNICAL SPECIFICATION
FOR
RAINWATER HARVESTING SYSTEM

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PART – I

Technical specification for Rainwater Harvesting System

1. General

Water is one of the most important natural resource; it is the most basic need for allliving beings as well as a very valuable national asset. In spite of astonishingachievements in the field of Science and Technology, nature remains to be a mysteryfor human beings. The shortage of water even for drinking is a perpetual phenomenonthroughout the world, especially in developing and under developed countries. RainWater Harvesting as a method of utilizing rain water for domestic and agricultural use isalready widely used throughout the world. The Rainwater harvesting is the simplecollection or storing of water through modern techniques from the areas where the rainfalls. It is as far the best possible way to conserve water and awaken the societytowards the importance of water.

There are two terms are of more importance in the field of rainwater harvesting. Theyare rainwater recharging and rainwater harvesting.

Recharge – Recharge may be defined as the process of augmenting the groundwatertable by providing artificial infiltration techniques which will reduce the excess surfacerun off and increase the storitivity of the soil. On the other hand, harvesting can bedefined as the process of utilizing the rainwater by means of its collection. Harvestedwater can be utilized for industrial and domestic purposes. Here terminalrainwater harvesting is planned.

2. Intent of specification:

This specification is intended to cover the supply and erection of rain water harvestingpipes, construction of cleaning manholes, and filter chambers on item rate basis to the Client for their upcoming project. The rain water harvesting system ismeant for supplying water to arboriculture of the terminal and for toilet flushing atadministration, amenity and lab buildings.

3. Scope of work:

The scope of this tender includes supply and laying of PVC pipes as shown in thedrawings and construction of manhole for cleaning and filters chambers to filter thesediments. Construction of 60 m3 storage tank is included in this tender as also providing connection between filter chambers to storage tank is included in this tender.

The detailed scope of work is as follows:

a) Supplying and laying of DN 160 PVC pipe line as shown in the drawings with suitable fittings/accessories as mentioned inthe drg.
b) Laying of pipeline includes excavation, bedding and refilling of the pipeline route.
c) Supply and laying of MS encasing pipes as shown in the drg.
d) Construction of related civil works like filters & cleaning chambers.
e) Supplying and filling of coarse sand and charcoal in the filter chambers.
f) Supplying of perforated pipes and connecting the same with insert provided in thestorage tank.

4. Method of rain water harvesting

The buildings are provided with rainwater down comers. The rain water down comers will becrossing the buildings apron and will be terminated before the rainwater header. Thedown comer will be connected to the main header with the help of Tees.

The scope of the rainwater harvesting contractor starts from connecting the down comerline to the sub header and sub header to main header. DN 160 has been envisaged forsub and main header.

4.1 Conveyance of rainwater

Conveyance system basically consists of rain gutters and down comers to receive therainwater flow from the rooftop, and convey it to vertical pipes leading to the storagetank. The rainwater around the building will be collected by DN 160 PVC pipes. ThePVC pipes will be buried below 350 mm from FGL. The rainwater lines will havesuitable Tees while connecting with down comers and will also have cleaningmanholes of 1.5mX1.5m X 1m size at equal intervals. The slope of the pipe shall bemaintained 1:300.

4.2 Filters

The rainwater line will be terminated in filter system envisaged to retain the sedimentsand other debris before entering the storage tank. Two numbers of filters have beenenvisaged on either side of the storage tank. The size of the filter will be of 4 X 3 X1.15m and will have two layers of filtering media of 300mm each consist of coarse sandand charcoal. A perforated pipe will be provided at the bottom of filter. The nonperforated pipe end will be connected with rainwater storage tank.

4.3 Cleaning chambers

In order clean the debris if any trapped in between the rainwater pipeline or collectedfrom roof top cleaning chambers have been envisaged. The size of the cleaningchamber will be 1.5x1.5x1m.

5. Technical specification of rain water harvesting system

This specification includes the following:

a) PVC pipes,

b) Filters,

c) Civil - Construction of chambers and filters ,

a) PVC pipes and fittings

PVC (polyvinyl chloride) shall be plain / spigot end. nominal outside diameter(Nominal size) of DN-160. The pipe shall be classified by pressure ratings as Class-5, 1.0 MPa (10 kg/cm2). The supply of PVC pipes shall meet as per Indian standardIS: 4985:2000.

b) Handling and storage

PVC pipes shall be stored on racks in which case they should be adequatelysupported at intervals of four feet. For a six meter length of pipe there should be fouror five supports. Pipes should not be staked under open area and it is staked undershade. On no account pipe should be dragged along the ground.

c) Trench preparation

The trench bottom should be carefully examined for the presence of hard objectssuch as flints, rock projections or tree roots. In uniform, relatively soft fine grainedsoils found to be free of such objects, and where the trench bottom can readily bebrought to an even finish providing uniform support for the pipes over their length.

The pipes shall be laid on sand bed with a thickness of 150mm.Trenching should notbe carried out too far ahead of pipe laying. The trench should be kept as narrow aspracticable but must allow adequate space for joining the pipes and placing andcompacting the back fill. A width of 12 inch over the outside diameter of the pipeshall normally be found adequate for the purpose

d) Pipe laying

The pipe should be positioned in the trench so as to avoid any induced stress due todeflection. Any deviation required should be obtained by using pre formed pipesbends. At all times during the handling and joining of pipes every effort should bemade to prevent the ingress of dirt any foreign material in to the bore of the pipe andif joining is stopped for a time the end of the last pipe should be blanked offtemporarily. The location of the buried pipe inside the trench shall be maintained as shown in the drawing.

e) Backfilling

PVC pipes although slightly flexible , are able to carry the external loads imposed uponthem in underground laying because, being able to deform to a considerable degreewithout fracture, they derive additional supporting strength from the lateral restrainedafforded by the soil at the site of the pipes which opposes any increase in the horizontaldiameter of the pipe. This lateral support is of prime important in enabling the pipe tocarry the external loads without excessive deformation. It is therefore important whenlaying PVC pipes to take adequate precaution to ensure that satisfactory compaction ofthe backfill, the lateral support is effective.

As with pipes of other material it is necessary to ensure with PVC pipes that sharpobjects such as large flints do not bear directly upon them and also that are not placedwhere they may come into contact with them after the passage of time.

In all cases care should be taken to remove all leveling pegs are temporary packingsuch as wooded wedges before backfilling.

f) Joining

Methods of joining PVC pipes

The methods of joining PVC pipes can be classified into two categories:

A) Using solvent cement joining (If PVC pipe is having spigot end at one side andsocket end at other side)

B) Using fusion joining (If PVC pipe is having socket ends at both the sides).

Both type of joining is acceptable and any one method shall be adopted for joining thepipes at site.

A) Using solvent cement joining

This type of joints shall be meant for smaller diameter pipes like DN160. This jointshall be made by the application of solvent cement to the mating surfaces of thespigot and socket end of the pipes. It is often described as a cold weld joint. Thespigot and socket of the pipe must be clean and dry. Roughen the surface withemery paper. If the ends are grossly contaminated clean them with acetone ormethyl alcohol. Apply solvent cement relatively thick on the spigot and thin into thesocket. For larger sizes allow the first coat to dry and apply a second coat.The spigot is pushed home into the socket.

B) Using fusion joining

These types of joints are also used for smaller diameter pipes like DN 160.Thisjoint shall be made by the application of heat to the mating surface of the socketends and pushed into the sockets home each other.

g) Testing

Where pressure testing is conducted on a pipeline jointed throughout with end loadbearing joints e.g., spigot and socket solvent weld, it is not absolutely necessary tobackfill the pipe before applying the pressure test, although it will probably be moreconvenient to do so. The pressure test should be conducted before backfilling thetrench. Before filling, the test to be carried especially to the joints inspected and test isjudged satisfactory.

TECHNICAL SPECIFICATIONS

SUPPLY AND INSTALLATION OF PRECOATED GALVALUME SHEET PROFILE FOR ROOFING & CLADDING WITH ACCESSORIES

SECTION XVII

TECHNICAL SCOPE OF SUPPLY & SPECIFICATION

1.0 SPECIFICATIONS

The specification for the entire scope of supply under the order shall be in accordance with the latest IS & AS codes. Wherever these codes are silent, the same shall be governed by sound Engineering practice, and the decision of the Client, in matter of interpretation, shall be final and binding on the Contractor. The Bidder must read carefully all such specifications / codes before submitting their Bid. It shall be deemed that the Bidder has thoroughly read & understood the "Scope of Work & Technical Specifications" before filling in the rates / prices, irrespective of the fact whether they have really done so or not, and no claim on this account shall be entertained at a later date.

2.0 SCOPE OF SUPPLY

The work mainly consists of Supply and installation of pre-coated Galvalume steel sheets with roofing & cladding accessories to the Client.

2.1 PRECOATED ZINC ALUMINIUM SHEET ROOFING / CLADDING

2.1.1 Material The base metal of the roofing shall be Cold Rolled Steel Sheet conforming to IS: 513. It shall be zinc aluminum coated by Hot-dip process as per AS:1397 / IS:277 / IS:14246, The bottom unexposed surface shall then be coated with alkyd backer of minimum 5 microns over a 5 micron coat a primer. Top exposed surface shall have primer of minimum 5 microns followed by SMP/ Super Polyester top coat of minimum 20 microns of specified colour.

Manufacturers of pre-coated sheets may be of the following:
i) Tata BlueScope Steel Ltd.
ii) JSW Steel Ltd.
iii) Bhushan Steel Ltd.
iv) CRIL
iv) Any other reputed brand approved by Client/Consultant.

2.1.2 Properties

The pre-coated zinc aluminium steel sheets meet the following performance standards.
Pencil Hardness Min. HB
T-Bending Test 5 T
Impact Resistance Min. 10J
Salt Spray Test 1000 Hours (Exposed top side)
QUV – Wealterometer Test 1000 Hours
Humidity Test 1000 Hours Temperature Resistance 100 deg C for 24 hours
Fire Performance Class-I

2.1.3 Profile

The profile shall have a depth of not less than 28mm at a pitch of not more than 255 mm (with intermediate ribs). Overall total coated thickness shall be minimum 0.50mm having base metal thickness of 0.45mm. Minimum weight (supply width) shall be 5.00Kg/SqM.

2.1.4 Accessories

All roofing accessories like ridge, corners, flashing, north light curves/ bend, and gutter, gutter pipe etc. shall be fabricated out of the approved pre-coated sheets. Details may be seen at site by the bidder. Metallic self-

drilling self-tapping fasteners for fixing shall be corrosion proof meeting performance standard as per AS: 3566, Class-III having neoprene washer. Sealants shall be neutral cure type and cold setting variety.

3. All the final inspected materials should be packed properly for transportation, loading/ unloading and storage purpose min. for one year. Packing & forwarding cost shall be included with offer.

4. Hi-tensile pre-painted Zincalume/Galvalume steel sheets:
Supply & Fixing of Prepainted coloured Trapezoidal profiled Sheeting 1000-1020 mm cover width, 28-30 mm high crests with subtle square fluting in the five pan at nominal 190-255 mm(as approved by Client) centre-to-centre manufactured out of 0.50 mm TCT hi-tensile prepainted Zincalume /Galvalume steel (AZ-150 gsm. Aluminium –Zinc alloy metallic coating of total both sides 550 MPa yield stress as per AS-1397). Colour/ Exterior coat of SMP (Silicon Modified Polyester) / BHP XRW paint system, 20 micron top coat applied over 5 micron primer and a 5 micron polyester back coat applied over 5 microns primer OR equivalent coating/painting. The sheet shall have wide pans with stiffening ribs for effective water shedding and special male/female ends with full return legs on side laps for purlin support. The male end of the sheet shall have anti-capillary flute at side laps to prevent leakages. The sheet shall be fixed by means of Galvanised self-drilling selftapping fasteners (12-14x55 with EPDM seals). The sheet shall be supplied in lengths maximum upto 6-12 meter long to suit site dimensions.

The scope includes all sealing of joint, curves, edges or other accessories with silicon sealant.
a) The bidder may consider CLIPLOCK system instead of self-drilling screw system without any change in specification, rates and terms and conditions of the work.
b) 0.50 mm thick TCT (Total Coated Thickness) / 0.45 BMT (Base Metal Thickness) precoated sheet of make "TATA BlueScope", "Lloyd" , Interarch or equivalent confirming with minimum tensile strength 550 MPa confirming AS : 1397. The sheet should pass 1000 hour salt test as per relevant test.

5. Supply & Fixing of Pre-painted coloured Trapezoidal profiled / PLAIN/ CURVED & PROFILED sheeting in ridges, curved surface, North light Curve, louver, corners, Apron Piece, Gutter, Gutter pipe etc. manufactured out of 0.50 mm TCT hi-tensile pre-painted Zincalume /Galvalume steel (AZ-150 gsm. Aluminium –Zinc alloy metallic coating of total both sides 550 MPa yield stress as per AS-1397). Colour / Exterior coat of SMP (Silicon Modified Polyester) / BHP XRW paint system, 20 micron top coat applied over 5 micron primer and a 5 micron polyester back coat applied over 5 micron primer OR equivalent coating/painting. The sheet shall be fixed by means of Galvanised self-drilling selftapping fasteners (12-14x55 with EPDM seals). The sheet shall be supplied in lengths maximum upto 6-12 Mtrs long to suit site dimensions. The scope includes all sealing of joint, curves, replacing louvered, edges or other accessories with silicon sealant. The bidder may consider CLIPLOCK system instead of self-drilling screw system without any change in specification, rates and terms and conditions of the work. Refer drawing.

a) The bidder may consider CLIPLOCK system instead of self-drilling screw system without any change in specification, rates and terms and conditions of the work. The work is to be carried out directly as per specifications and direction of engineer-in-charge and the manufacturer.
b) 0.50 mm thick TCT (Total Coated Thickness) / 0.45 BMT (Base Metal Thickness) precoated sheet of make "TATA BlueScope", "Lloyd" , Interarch or equivalent confirming with minimum tensile strength 550 MPa confirming AS :1397 The sheet should pass 1000 hour salt test as per relevant test.

6. Non-asbestos sheet:
Providing non-asbestos high impact Polypropylene reinforced cement 6mm thick corrugated sheets (as per IS: 14871) roofing up to any pitch and fixing with polymer coated J, or L hooks, bolts and nuts 8mm dia. G.I. plain and bitumen washers or with self-drilling fastener and EPDM washers etc. complete (excluding the cost of purlins, rafters and trusses), including cutting sheets to size and shape wherever required. The scope includes all sealing of joint, curves, edges or other accessories.

7. Paint:
Supplying and Applying of Paint on structural steel work like roof trusses, steel column, frame, top chord, web, lateral bracing, truss plate, strut, purlins, bottom chord bracings with supply of all materials, manpower, tools & tackles, scaffolding etc. at any height. Paint system includes surface preparation + F 8 (self-priming type, surface tolerant high build epoxy coating as per EIL spec. code) full one coat of 100 microns + F 6A (Epoxy high

build finish coating; EIL spec code) full one coat of 100 micron + F 2 Page 4 of 6 (Acrylic Polyurethane Finish Paint; EIL spec. code) two coats, each 35 micron (Total DFT 270 micron on average)including scraping/cleaning old surfaces and surface preparation by brass chipping / Wire brush/ Emery paper/whipping by dry/wet cloth or combination of above to the entire satisfaction of the Client.

8. SKYLIGHT (POLYCARBONATE SHEETS):
Supply and installation of 2 mm thick clear embossed polycarbonate sheet (polycarbonate profile to match with standing seam profile) with side laps to be clamped with galvalume sheets of 0.55mm (tct), which can be further seamed with metal roof sheets. Product required is clear embossed with both side UV stabilizer, having at least 60-80% transparency, conforming to the relevant IS code including cutting to shape and size as required including necessary sealants (silicon sealants/butyl sealants for transverse laps).

9. Turbo Ventilator:
Supplying, fixing and installation of dia 600 mm Wind driven Turbo Ventilator on pre-coated trapezoidal sheet with FRP base of Devasish, Airier, Sudha or equivalent make. The rates are inclusive of all related works including sealing of opening and making it leak proof and finishing to match with existing roof. All as per manufacturers specifications and as directed by the Engineer in charge.

10. SAMPLES FOR APPROVAL
The contractor shall furnish to the Engineer-In-Charge for approval of samples of all material to be used in the item/work. Such samples shall be submitted before item/work is commenced in advance. Profile of ridges, curved surface, North light Curve, louver, corners, Apron Piece, Gutter, Gutter pipe is to be decided by EIC. It is the responsibility of the contractor to arrange for tests as required by Engineer-In-Charge at his own cost. The material representing approved samples shall only be used for the construction and installation. Contractor shall procure materials as indicated in list of approved makes (if given) / or materials with ISI certification may also be used after approval of EIC. TESTS / INSPECTION: Contractor has to make all the arrangements for tests / inspection either at site or elsewhere at his own cost and expenses. Also necessary laboratory tests may be carried out at his own cost and expenses. However, contractor must use ISI marked materials or materials of listed approved make, wherever required. Contractor shall arrange necessary test as per standard practice and decided by EIC for the materials used for the work. However, the contractor has also submitted the test certificate of material provided by manufacturer.

11. The rate also includes testing of samples of various materials (field or laboratory) and transportation of the materials at site including applicable VAT, all taxes & duties etc., loading & unloading etc.

12. Any other requirement which is not covered in the scope of supply but necessary to complete the supply and work are to be complied by the bidder with the coated rates.

13. Bidder may visit the site of works before quoting his rates / prices for correct assessment of work.

14. Length of the sheets & roofing accessories should be 1.5m, 2.0m, 3.0m, 4.0m, 5.0m, 6.0m or as per direction of Client. However, bidder may assess the app. Qty of all sizes by visiting the site before submitting the offer.

15. Colour of the sheets shall be finalized by Client. Bidder has to supply the materials exactly as per colour suggested by Client. Party has to supply the materials in quantity as per order. However, quantities of different sizes may be varying as per requirement of Client.

16. ROOF DECKING

1.00 Scope
This section of the specification covers the supply, fabrication and erection of profiled light gauge Metal Decks (coated and painted) as roof decking to the main plant building and any other area as indicated in the drawings.

2.00 Material

2.01 Roof of main plant TG, Deareator bay, bunker building,cw pump house consists of permanently colour coated (on exposed face) galvanized MS trough metal sheet decking plate of approved colour over roof purlins for castin-situ roof slab as per IS: 14246 and conform to class 3. Thickness of deck plate shall be minimum 0.7mm and minimum trough depth of 44 mm and centre to centre of the valley shall be 130mm with minimum yield strength of 250 Mpa. Silicon modified polyester paint shall be used for permanent coating over galvanized surface with minimum rate of galvanization 275 gm/sqm. DFT of permanent colour coating shall be 20 microns on exposed surface and minimum 7 micron on other face. It shall serve as permanent shuttering for cast-in-situ roof slab. It should have adequate strength to support weight of green concrete and imposed load during construction. The thickness of the deck plate shall however be designed suitably according to the spacing of roof purlins.

3.00 INSTALLATION

The Contractor shall furnish all labour, equipment and materials as required for the design, fabrication, coating, erection and fixing of the decking over purlins, painting and for the complete performance of the work in accordance with the construction drawings and as described herein. The description, which follows, gives a general indication of the nature and extent of the work but is not necessarily exhaustive and does not purport to cover all the details/operations which will be necessary in order to carry out the work.

3.01 Detailed Design of Roof Decking

The Contractor, in conjunction with the manufacturer, shall be responsible for the detailing of the profiled decking, fittings and fixtures and shall submit with his tender particulars of the proposed manufacturer and of the particular product proposed for use. The detailing is to be based on typical details furnished by the Engineer. The Contractor shall submit to the Engineer, two copies of the general arrangement and detailed working drawings for the proposed design, together with all calculations necessary to verify the adequacy and completeness of the design & detailing of decking sheets, fixtures, flashings and trims. After approval he shall supply further eight copies. The Engineer will verify the correct interpretation of his requirements but may not necessarily check the design and details, and the Contractor shall be entirely responsible for the accuracy of the drawings and the correctness of the design and the suitability of the details. Manufacture of roof decking sheets shall not commence until the necessary approval of the Engineer has been obtained.

3.02 Erection & Fixing

3.02 Sequence of Manufacture/Erection

Cutting Schedules, delivery to site and stacking arrangements in store shall ensure that sheets are erected in a sequence which follows that for the manufacture. The decking sheets shall be erected using an arrangement of sheets and joints to conform with the requirements of this specification. Decking erection for each elevation or feature shall commence at one end only and proceed towards the other end, in order to ensure tight fitting laps.

3.02.02 Position and Location of Laps

Side and end laps of roof decking sheets shall be located and positioned in such a manner as to provide the maximum weather protection taking into account the direction of the prevailing wind. The lines formed by horizontal laps and fixing shall where possible, be continuous and coincide with the edges of large openings in the roof.

3.02.03 Alignment of Sheets and Fixings

All roof decking sheets shall be fixed plumb and level with all fixings evenly spaced and accurately lined. All dirt and grease shall be removed from the surfaces of the sheets as the work proceeds.

3.02.04 Site Cutting

Approval must be obtained before the roof decking sheets are cut at site. Generally cutting of sheets to length will not be permitted, only special cutting and trimming for small openings shall allowed. Where possible, site cut edges shall be concealed at laps.

3.02.05 Damaged Sheets

Distorted, blemished or water stained sheets and any other fittings shall not be used.

3.02.06 Laps
End laps and side laps to roof decking sheets shall be sufficiently large to ensure that the decking complies with the weather tightness and other requirements of this specification. The length of each decking sheet shall be adjusted so that the end laps shall bear on the purlins. In no case end laps shall not be less than 150 mm and side laps shall not be less than 53 mm.

3.02.07 End Lap Fixings
End lap fixings shall be located at least 25 mm from the end of each sheet.

3.02.08 Side Lap Fixings
The spacing of side lap fixings shall ensure compliance with this specification regarding tightness. The spacing of these fixing screws shall not exceed 500mm. The fixing shall be located in the bottom flat of the corrugation.

3.02.09 Holes
Holes in MS decking sheets shall be punched. In case holes are drilled holes, it is to be ensured that the holes do not go oversize due to the small thickness of the sheeting. All drilling swarf shall be removed from the surfaces of decking, supporting steel work, purlins etc.

3.02.10 Location and Spacing of Fixings
Fixings shall be accurately located in position in the centre of the corrugations to ensure that the heads of bolts, nuts and washers bear squarely down on the surface of the sheeting and are not located at the edge or on the joints in supporting purlins.

3.02.11 Fixings
The tenderer shall submit with his tender details of the proposed method for securing the roofing sheets to the metal purlins. The roof decking sheets are to be fixed to the roof purlins with hex washer head white zinc plated heat treated carbon steel self drilling / self tapping screws of minimum thread diameter of 5.6mm. These self drilling screws shall be drilled through the roofing sheets and purlins supporting the roofing sheets. These purlins shall be suitably spaced as per the requirement of roofing sheets and the roofing sheets shall not sag more than span/250 for the loads likely to be imposed during concreting and in future. The self-drilling screws are to be spaced at a maximum distance of 390mm centre to centre along the length of the purlins and top chord of truss. The screws are to be located preferably in the valley only and shall be installed in accordance with the manufacturer's recommendations using tools approved by the manufacturer which do not damage the coating of the decking sheets.

3.03.00 Protection during Construction
Precautions shall be taken during the erection of the roof decking to ensure that partially erected decking are protected during inclement weather and damage at all times.

3.04.00 Damage
Any damage to coating & primer during transportation is to redone with the similar type of coating as per the manufacturer's specification at no extra cost to the Owner.

4.00 Acceptance Criteria
The installation shall present a neat appearance and shall be checked for water tightness. The following shall be checked : a) Side and end laps b) Absence of damage in the sheeting. c) Conformity of fixings with the approved design.

5.00 IS Codes
All work shall be carried out as per this specification and shall conform to the latest revision and/or replacements of the following or any other Indian Standard (IS) Codes, unless specified otherwise. In case any particular aspect of work is not specifically covered by Indian Standard Codes, any other standard practice, as may be specified by the Engineer, shall be followed. IS : 513 - Specification for cold rolled carbon steel sheets. IS : 3618 - Specification for phosphate treatment of iron and steel for protection against corrosion. IS : 4431 -

Specification for carbon & carbon manganese free cutting steel. IS : 1573 - Electroplated Coatings of zinc on iron and steel.

6.00.0 RATES AND MEASUREMENTS

6.01 Rates Rates shall be unit rate for complete item described in the Schedule of Items and shall include all wastage.

6.02 Method of Measurement

Roofing shall be measured for net area of the work done. Profiled sheeting (coated & painted) shall be measured in plan area of sheets and not girthed. No deduction shall be made for openings measuring up to 0.1 sq.m. in area. No extra shall be paid for extra labour in cutting and for wastage etc. in making opening and cutting to size. No payments shall be made for laps.

List of approved Makes for Civil works		
Sr. No.	**Description of Item**	**Approved Makes/ manufacturers**
1	Cement(OPC/PPC/PSC)	Ultratech, Gujarat Ambuja, Lafarge,Birla, RAMCO, ACC, Chettinad, Coramandal, Zuari,Jaypee, JK Lakshmi,Prism
2	Reinforcement steel/structural steel	TISCO, SAIL, VIZAG STEEL (RINL), JISCO, JVSL, LLYOD STEEL, ESSAR
3	Water proofing Compounds/Admixtures	Pidilite / Sika/ Fosroc
4	Ceramic floor tile / wall tile	Somany/ Johnson / Kajaria/Murudeswar/NITCO
5	Polished vitrified ceramic tile	Marbogranite / Granamite / Diamontile/somany/NITCO
6	Plywood	National / Kit ply/ Green ply / Assam Prestige
7	Lamination	Decolam / Formica / Sun Mica/Green Lam
8	Aluminium door/window	Jindal / Indal / Hindalco
9	Floor spring/door closer	Everite / Hardwin/Dorma
10	Acrylic emulsion Paints / distempers /synthetic enamel paint	ICI / Asian Paint/ Berger / Nerolac
11	Cement Paint	Snowcem / Berger/Nitco / Asian Paint/Nerolac
12	Glazing / glass	Modi float / Saint Gobain/ASI/Gujarat Gaurdian
13	Paver block	Designer pavings / Vibrant Besser / Aeons / Hicon / Malu/ Shan Fly ash/ Sheild/approved eqvavalent
14	Pre-coated Sheets for Roofing / Side Cladding Sheets and sheets for canopy	Inter arch / Inter Tech / Tiger steel / Intersil Metallic products (Conwed) / Kirbi / Jindal steel (JSW) / Tata BlueScope Steel Ltd./ Bhushan Steel Ltd. / CRIL
15	False ceiling material for canopy	Inter arch / Inter Tech / Tiger steel / Luxalon/ Intersil Metallic products (Conwed) / Kirbi /
16	Water closet / wash basin / urinal / flushing cistern / WC cover / Sanitation / Plumbing Items	Hindustan Sanitary ware, Parryware, Neycer
17	PVC pipe	Supreme / Prince/ Finolex / Oriplast/Flow Guard/Jain Irrigation / Astral
18	GI pipe / MS pipe	Tata/ Zenith/ Gujarat steel (GST)/ Jindal/Surya
19	Gun metal gate valve / check valve	Leader / GG/ South Paint (ISI marked)/zoloto
20	PVC water tank	Sintex / Reno/ Aquatech/POLYCON/UNIPLAST
21	Glass, mirror	Modi Guard, Saint Gobain, Float Glass,ASI
22	G.I Malleable fittings	Unik, Zoloto
23	GM or copper alloy Gate/peet/ globe / check valve	Kingston, Leader, Zoloto, GG
24	HDPE Pipe	Prince, supreme, Jain Irrigation, Finolex, Kissan.
25	SWR - PVC pipe & fittings	Prince, Premium, Supreme, Finolex, Kissan, Astral
26	Water supply - PVC pipes & fittings	Prince, supreme, Jain Irrigation, Finolex, Kissan.
27	Flush valves	Jaguar, Parko, Orient,Plumber,ESSESS
28	Electronic flsuh valve for Urinal	Cera, Parryware, Jaguar
29	Water Pumps & Pump sets	Kirloskar,KSB, Texmaco,Suguna,CRI,GRUNDFOS
30	Ductile iron Man hole Covers and Frames	Jeyswal NECO, Kejariwal, Kiswock
31	UPVC pipes & fittings	Prince, supreme, Jain Irrigation, Finolex, Kissan, Astral
32	CPVC pipe	Prince, supreme, Jain Irrigation, Finolex, Kissan, Flowguard, Astral
33	Polysulphide sealant	Pidilite, Fosroc ,Sika
34	Gypsum Board System	India Gypsum, Laffarge

35	Pre-Laminated Particle Board	Novopan, Greenlam, Kitlam, Marino
36	Flush door shutters	Century, Kitply, Novapan, Green Ply, Marino
37	White Cement/Wall Putty	Birla White, JK,NCL
38	PVC doors	Rajshri, Sintex,Plasopan

List of approved Makes for Electrical works

1	MCCB/ELCB/MCB	L&T / Seimens/ Havells/schneider/standard/Legrand
2	SFU/ FSU/ HRC/ fuses / MCB	L&T / Havells / Alsthom/ Standard/schneider
3	MCB Distribution Boards	MDS / Havells/ Hager/ MK SENTRY/schneider/Hensel
4	PVC conduits and accessories	Prince/supreme/Finolex
5	PVC Insulated copper wire (FRLS)	Finnolex / Havells / Polycab/RK Kable
6	Switch / sockets	Anchor Roma / MK India/havells
7	Angle holder / batten holder/ ceiling rose	Anchor
8	TV/ telephone socket	Anchor Roma / MK India
9	Telephone wire/ cable	BSNL Approved make
10	LT cables	CCI/ Universal / Nicco/ Finnolex / Glowstar/ RPG
11	Light fittings / ballast / lamps(CFL/TL)	Philips/ Wipro/ Bajaj/ Crompton/GE
12	Ceiling fans (double ball bearing)	Crompton / Polar/ Khaitan / Havells
13	Exhaust fans	Crompton / Polar/ Khaitan / Havells
14	KWH meter	BHEL/ SIMCO/ India Meter/schneider
15	Ammeter / Voltmeter	L&T / AE/ IMP/MECO/RUSHAB
16	Selector switch	L&T/Standard/GE
17	Indicating lamps (LED type)	Siemens/ Technic/GE
18	GI pipes / MS pipes	Jindal / GST/ Tata/ Zenith/Surya

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SCHEDULE OF APPROVED MAKES / MANUFACTURER'S OF MATERIALS
(to be read along with the above Schedule of Makes)

The following guidelines are to be noted with regard to use of materials in the work :

1.00 As far as possible, materials bearing "Standard Mark (ISI)" from Bureau of Indian Standard (BIS) shall be used in the work.

2.00 Wherever, materials bearing Standard Mark (ISI) are used in the work, the following shall be ensured :

2.1 The supplier has a valid license form BIS during the period the material is being used in the work.

2.2 The Contractor should maintain furnish necessary documents and proof of payments made for the procurement of materials bearing Standard Mark (ISI).

3.00 Due to non-availability of materials, bearing ISI Mark as detailed in Para-2 above the materials as per the list of approved makes of materials shall be used in the work and the Contractor shall be free to use any of makes given in the attached Annexure.

4.00 In case, it is established that standard material (bearing ISI Mark) as well as the materials indicated in the list (as mentioned in the above para) are not available in the market then approved equivalent materials may be used in the work subject to approval from the consultant and Engineer-in-Charge.

5.00 Mandatory Tests shall be conducted at the specified frequency specified in the Contract. In case, frequency of testing is not stipulated in the contract then standard specification (R&B,CPWD,ISI etc.) may be considered for frequency at which materials are to be tested.

6.00 Before bulk purchase of quantities of materials, it is the responsibility of the Contractor to get the samples of materials approved from consultant and EIC.

7.00 All cost towards the testing shall be borne by the contractor.

LIST OF MAKES FOR CERTAIN MATERIALS ACCORDING TO WHICH THE MATERIALS TO BE PROVIDED

1. Ordinary Portland Cement
   Ambuja, Ultratech, Sanghi, ACC, JK, Vikram, Birla Cement, Binani
2. White Cement
   J.K. White, Birla White, Nihon White
3. Reinforcement Bar
   TATA, SAIL,Thermax, Vizag, Sanghi, Jindal or equivalent
4. Structural Steel
   SAIL,TISCO, ISCO, Vizag
5. Teak Wood
   Bulsar/ C.P Teak (Second Class specified)
6. Sal Wood
   Sal wood [Indian or Imported] First class
7. Kota Stone / Marble / Granite /Jaisalmer Stone As per approved sample
8. Ceramic Tiles (White, Colored, Anti Skid)
   Bell Ceramics, Somani, Kajaria, Nitco, Cera, Johnson, Asian, Restiles
9. Vitrified Tilles (White, Colored, Anti Skid)
   Bell Ceramics, Somani, Kajaria, Nitco, Cera, Johnson, Asian, Restiles, Granamite
10. Chequered Cement Tiles / Decorative Tiles
    Nitco, NTC, Kajaria, Vyara
11. White Glazed Tiles
    'H & R Johnson', 'Somani Pilkington', Nitco, Cera, Bell, Kajaria, Asian
12. Interlocking paver blocks
    Regency, Gurjari, Vyara, PEEDEE, Jagruti – Surat or as approved by Client/consultant
13. Plywood Products
    Commercial Block Board Commercial Ply Teak Ply, Greenply, Novopan ,/Sitapur Plywood/ Kitply /Century, Anchor, Duro, National wood craft, Alpro, Neolux Laminated, Formica, Decoboard, Sunmica Board/Bhutan, Green Ply, Western India plywood (WIP). M.P., Mysore marine.
14. Laminates / Decorative laminates
    Decolam, Greenlam Merinolam Formica, National laminate, Neoluxe, Decolite, Delta.
15. Pre laminated board
    Bhutan, Novapan, Eco board, Bakelite Hylem Nepal board, Green board.
16. Impregnated Fibre Board
    Shalitex by Shalimar Tar Product.
17. Teak Veneer
    Anchor, Kitply or equivalent
18. Flush Doors
    'Sitapur plywood', 'Mysoboard', Sudarshan W & P Industries, Bajwa, Baroda, Goyal, industrial corp, Wood craft, Jain wood industries, Alpro, Genda- Northen Doors, Greenply, Kitply, Bhutan.
19. Aluminium Section
    Indal, Hindal, Jindal, Ajit, Banco, Gujarat Extrusion, Hindalco, Mon, Domal
20. All Aluminium Hardware, Fittings
    Everite, Garnish, Arches, Kausal, Nulite Alif, Shalimar (Bombay) Singla, Opel, Bolt, Arhish
21. Aluminium Doors, Windows, Partitions Fabricators
    As approved by Client/Consultant
22. Stainless Steel Hardwares Fittings
    Kitch, Dorma or As approved by Client/Consultant
23. Glass/Float/Sheet
    Saint Gobain, Modi, Hindustan Pilkington , Hindustan , Tata , Asahi, Triveni, Shree Vallabh
24. Door Closer / Floor Spring
    Godrej / Everite, Opel, Doorking/ Hardwin, Nulite, Hyper, Ezec,
25. Locks
    Godrej, Harrison, Plaza, Golden, Doorset
26. Friction Hinges
    Imax, EBCO
27. Rolling Shutters
    ' Standard', 'Swastik', 'Diana', 'Hercules', As per approved fabricator.
28. Gypsum Board False Ceiling

Indian Gypsum or equi.

29. Polysulphide Sealant For Expansion Joints All Windows
Chokesy Chemical, Structure Proofing Co Pidilite, GESilicon, Tuffseal
30. Synthetic Enamel Paints /cement based paint
Shalimar', ICI', 'Goodlass Nerolac', , Berger, Johnson & Nicholson, Asian Paint, Dulux
31. Water Proof Acrylic Paints / Weather proof Acrylic Paints
'Super Snowcem', Supercem, Asian, Nerolac, Berger, Dulux
32. Plastic Emulsion paint
J & N, ICI, Asian, Berger, Dulux
33. Dry Distemper / Oil Bound Distemper
Shalimar', ICI', 'Goodlass Nerolac', , Berger, Johnson & Nicholson, Asian Paint, Dulux
34. Construction Chemicals/ Water Proofing Compound
' CICO' , Fosroc, GE sillicon Pidilite, MC-Bauchemie, Sika Dr.Beck & Co.
35. Weather Sealent / Silicon sealent / Poly isobutylene sealent
Fosroc, Pidilite, MC-Bauchmie, Wecker 789, Dow corning 789 or equivalent, Sika, Dr.Beck & Co.
36. Hardeners
'Ironite', 'Ferrok', 'Hardonate'.
37. Wire Mesh
Sterling Enterprises, Trimurti, Welded Mesh.
38. Anti-Termite Treatment
Chiramices. Thyodin by Hoechest, Lyntric by Bayer India, Durmet by Cynamid India, Nocil Pyramid
39. Polycabonate Sheets
Lexan, GE
40. M.S. Tubes
TATA, SAIL, Vizag, Jindal or equivalent
41. Aluminium Composite Panel
Flexibond-Umiya Flexifoam Pvt. Ltd., Aludecor Lamination Pvt. Ltd., Indobond-ACP Marketing Pvt. Ltd., Eurobond, Ultrabond, Durabuild, Ultra panel
42. Pre coated Sheets
Tata Blue scope, Multicolor steels, Interarch, Kirby, Tiger steel
43. Thermal Insulation
Twiga, Multicolor steels
44. Polyester Fibre
Recron 3S or equi.
45. LDPE Sheet Approved make by Client/Owner/Consultant
46. Welding Rod
Advani, Philips, Sunarc, Eshab
47. Fly ash Bricks
As approved by Client / Consultant

LIST OF MATERIALS OF APPROVED BRAND / MANUFACTURER
(ONLY FIRST QUALITY TO BE USED (WATER SUPPLY & SANITARY WORKS)

1 Cast Iron Pipes and Fittings (LA Class)
TISCO / ISCO/ KESHO SPUN Co. - Calcutta E.L.C. Standard approved manufacturers of any other brand of fittings having ISI marking.)
2 R.C.C. Pipes
Indian Hume Pipe Co., Alcock Cement Products,Patel Spun (Surat)
3 G.I. Pipes
Jindal, Prakash, Surya, Gujarat Steel Tube, Tata, Bharat Steel Tube, Bombay, Zenith, G.S.T.Unik.
4 G.I. Fittings
" R " Mark, Unik.
5 Gun Metal Valves
Leader Engineering Works, Jallandhar, Crown / prince - Surat Bombay Metal Co Annapurna Metal Work, Calcutta'Sant' brand, Jallandhar, L&K, Bombay metal & Alloy man. co. Bombay, Premier,Aatco,Atlas,BR,BS,NN.
6 Brass fittings
Leader Engineering Works, Calcutta L & K Mathura, Crown / Prince -Surat Annapurna Metal Works, Calcutta, Perko, Kingstone Ark, Enclss Willians, Chilly, Aquva Plus,Nova,Kingstone,Driple, Ranutrol Hansa.

7 C.P. Fittings
Ego Metal Works, Ballabhgarh,; GEM, New Delhi; Soma Calcutta; Bilmet, Bombay 'ESSCO', Delhi. Rajka Metal Works, Delhi Eng. Co. Metal Works, Calcutta Everite, NU-Lite Navbhart Shalimar Crown, Prince
8 W.C. Pan / Wash basin / Urinals/flushing cistern
CERA, E.I.D. Parry, Hindware , Neycer, Johnson, Jaquar
9 Flushing Cistern -Cast iron
Overhead - 'Nomos' 'ELCO' 'A-1'AUTOMATIC-EID Hindustan Sanitaryware, Calcutta, Nelson flush valve, SRIF(Agara), Parrys –Madras, Jaquar
10 E.W.C. Seats (solid)
E.I.D. Parry, Hindware, CERA, Neycer, Hindustan. Jaquar
11 Stainless Steel Sinks
Nirali, Diamond, Nilkanth, Cobra, AMC, Jayna
12 Mirrors
Atul Glass Works , Haryana Sheet Glass Vallabh Glass Works, Modi Float glass, Asahi, Saint Gobin
13 Plumbing / Sanitary Fixtures / Accessories
Jaquar continental, CERA, Hindustan Sanitaryware / Parryco India. Hindware, Lauvet, Kohlar, Rak, Jaquar
14 C.I. Sluice valve, Check valves
Kirloskar, IVC,Burn,William Jacks, Indian Valve(IVC), Advance, Leader.
15 HDPE pipes
Duraline , Pennwalt Agru , Nocil, Jain, Supreme
16 Fibre reinforced R.C.C. ManholeCover
Pratibha, CIDCO, approved brand
17 C.I. Manhole cover with frame
ISI approved make
18 P.V.C. Pipes & Fittings
Supreme, Prince, Finolex, Laxmi, Prakash, Jain, Astral
19 P.V.C. / H.D.P.E Water Tanks
Sintex, Purvee, Renu or equivalent
20 Ball Cock
GPA Brand by Govardhan Das Jullunder, L & K Brand by L. K. Industries Mathura, Sant Brand by Sant Press Metal Works Jullundhar
21 UPVC Pipes (Solvent Welded Joints)
Supreme, Prince, Jain, Finolex, Astral
22 C.P.V.C. Pipes & Fittings
Astral, Finolex make
23 Fire Hydrant Valve & Air Valve, Scour Valve
ISI approved make

*** Notes :**

a) The contractor shall produce samples of the materials for approval of the Client / Consultant. The materials of the makes out of the above as approved by the Client / Consultant shall be used on the work.
b) In respect of materials for which approved makes are not specified above, these will be of makes to be decided by the Consultant.