INTERNATIONAL CENTRE for THEORETICAL SCIENCES

TATA INSTITUTE OF FUNDAMENTAL RESEARCH

SALIENT GOVERNING FEATURES OF THE TENDER/ WORKS 2008

(Operative Schedule of Individual Tender)

NAME OF WORK: Providing and constructing external Developmental works/Hardscape work for Discussion court in ICTS-TIFR Campus, Shivakote village, Bengaluru north.

NIT NO.: ICTS/TIFR/ PE / Project /09 / 2016 Dt : 28/09/2016

ICTS-TIFR Campus, Survey No. 151, Shivakote
Bengaluru - 560 089.
Telephone Number: Tel: +91 - 80 - 4653 6000
Fax: +91 - 80 - 2360 8199

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IMPORTANT NOTES AND GENERAL GUIDELINES

1. This booklet "Conditions and Clauses of Contract – 2008" is Standard Form for invitation of Tenders in TIFR-ICTS.

2. This booklet consist of Standard forms of Detailed NIT, Item Rate Tender & Contract for Works, General Rules & Directions, Conditions & Clauses of Contract, Safety Codes, Labour Regulations, Guarantee Bonds, Salient Governing Features of Tender / Work with Proforma of Schedules "A" to "F" etc.

3. This Standard Form booklet of "Conditions and Clauses of Contract" will not be issued along with the Tender Documents but the same shall form part of the Contract / agreement to be executed and signed by both the parties after acceptance of the Tender.

4. All the blanks and variables in this booklet are confined to the **Salient Governing Features of the Tender / Work** (Which is an operative Schedule of Individual Tender / Work) and include Notice Inviting Tenders and Proforma of Schedules "A" to "F".

5. NIT / Tender approving authority shall fill-up all the blanks and Schedules in the **Salient Governing Features of the Tender / Work,** and the same shall be issued to all the prospective Contracting Agencies alongwith other Tender Papers.

6. Intending bidders need to quote their rates as per Schedule "A", i.e. in the Financial Bid, issued with the tender papers.

7. Standard Formats given in this booklet for Labour Regulations, Guarantee Bonds / Indentures for Secured Advance, Registers and Schedules "A" to "F" are only for information and guidance. These are not to be filled in this booklet, but to be made use of as per Tender / Contract provisions.

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Salient Governing Features of the Tender / Work
Proforma of Schedules

SCHEDULE 'A' **Reference to NIT & Tender Documents**

SN	TITLE	PARTICULARS	PAGE
1	Changes in conditions of contract	Correction Slip: CDN / C1, C2 & C3	**9-12**
2	Notice Inviting Tender (NIT) No.	ICTS/TIFR/ PE / Project /09 / 2016 Dt : 28/09/16	
3	Notice Inviting Tender details	i) NIT as uploaded on Web Site	***NA***
		ii) NIT as published in News Papers	***NA***
		iii) NIT as circulated to pre-qualified Agencies	**NA**
4	Scope and location of the work:	Enclosed	***16***
5	List of drawings	Enclosed	***17***
6	Time Schedule for the work:	Enclosed	***194***
7	List of changes if any in specifications**:**		
	a) Specifications for Civil Works – 2015 :	Additional: SPN-CVL	**-**
8	Schedule of Quantities (Enclosed) -	**Please refer Financial Bid**	

SCHEDULE 'B'

Schedule of materials to be issued to the contractor

S. No	Description of item	Quantity	Rates at which the Materials will be charged to the contractor	Place of issue
1	2	3	4	5
1.	Grey Cement in bags		Contractor's own supply	*NA*
2.	Re-Bars for RCC		Contractor's own supply	*NA*
3.	Water for construction purposes		Contractor's own supply	*NA*
4.	Electricity for construction purposes		Department Supply unit charge at Rs.8.00/unit.	*NA*
5	All specified materials		Contractor's own supply	*NA*

SCHEDULE 'C'

Land earmarked for temp. infrastructures and Tools & plants to be hired to the contractor

S.No	Description	Hire charges	Place of issue
1	2	3	4
1.	Area for storage / site office (SCC-11)	As per Clause SCC-11	Site premises
2.	Temporary Buildings (SCC-12)	As per Clause SCC-12	Site premises
3.	Labour hutments (SCC-12)	No labour hutment permitted at site	

SCHEDULE 'D'

Extra schedule for specific requirements / documents for the work, if any Particularly for Security guidelines, Gate pass, lift, tower crane etc,	Nil

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SCHEDULE 'E'	Reference to the Book of "Conditions & Clauses of Contract" to be followed for this work	As enclosed
		As per NIT
Estimated cost of work :	Rs. 50.31 lakh	As per NIT
i) Earnest money	Rs 1.00 lakh	As per NIT
ii) Performance Guarantee	*5% of tendered value*	As per Tender
iii) Security Deposit	*5% of tendered value*	As per Tender

SCHEDULE 'F'

General Rules & Directions :	
Tender inviting authority	Director, ICTS
Quantity of Items of work to be executed with put any price variation.	As per actuals.

DEFINITIONS : (CCC-2008, P. 11)		
2(v)	Engineer-in-charge	Project Engineer, ICTS
2(viii)	Accepting Authority	Director, ICTS
2(x)	Percentage on cost of materials and labour to cover all overheads & profits	15% (Fifteen percent)
2(xii)	Department	ICTS-TIFR, Grant-in Aid institute under
9(ii)	Standard Contract Form of Dept.	Item Rate Tender

CLAUSE – 1 (CCC-2008, P.13)	
i) Time allowed for submission of Performance Guarantee from the date of issue of letter of acceptance / WO.	15 days
ii) Maximum allowable extension beyond the period (provided in (i) above.)	7 days

CLAUSE – 2 (CCC-2008, P.14)	
Authority for fixing compensation under relevant clause..	Director, ICTS

CLAUSE – 5 (CCC-2008, P.15)		
Number of days from the date of issue of letter of acceptance / WO for reckoning date of start.		15 days
Mile stone(s) as per table given below:		

TABLE OF MILE STONE(S)			
Sl. No.	Description of Milestone (Physical)	Time Allowed in days (from date of start)	Amount to be with-held in case of non achievement of milestone
1.	NIL		
2	NIL		

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Time allowed for execution of work	03 Months
Authority to decide: i) Extension of time ii) Re-scheduling of Mile Stone	Director, ICTS. NA

Clause - 10A (CCC-2008, P. 19)	List of testing equipments to be provided by the contractor at site lab		
(i)Excavators/JCB /Manual	(ii) Cutting machine	(iii) Dumpers / Tippers	(iii) LMV's
(iv) Drilling machine	vx) Additional Equipment if any.		

(Mobilisation Advance) – No.

Escalation – Not applicable.

Clause – 36(i) **Requirement of Technical Representative(s) and recovery Rate**						
Sl. No.	Minimum Qualification of Technical Representative	Disci-pline	Designation (Principal Technical / Technical representative)	Min. Exp. In yrs.	No.	Rate per month at which recovery shall be made from the contractor in the event of not fulfilling provision of clause 36(i).
1	*Graduate Engineer*	Civil	Technical representative	***5***	***1***	***Rs.30,000.00***
2.	Diploma	Civil /Electrical	Supervisor (Full time)	***5***	***2***	***Rs.20,000.00***

Note: i) Assistant Engineers / Scientific Officer- "C" & above, retired from Govt. services that are holding Diploma, will be treated at par with Graduate Engineers.

ii) The contractor to deploy adequate Nos. of technicians, site supervisors, accounts & office staff, till completion of works.

Notes:

1. *In the case of any discrepancy between these "Salient Governing Features of the Tender/ Work" & the book "Conditions and Clauses of Contract, stipulations given in these "Salient Governing Features of the Tender/ Work" shall take precedence.*
2. *It will be the responsibility of the Contractor to get the character & antecedents of the regular staff & Supervisors, engaged by them, for carrying out the work being awarded to him, verified from the Police authorities and produce the report of the verification to the Security at the gate under intimation to Engineer-in-Charge of the work.*

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CDN/C-1 : LIST OF CHANGES / MODIFICATION IN THE CCC - 2008

SN	Existing Provision	Modified Provision
1	**SECTION - 1: NOTICE INVITING TENDERS**	
1.1	Sl. No.5, Page6 : **Earnest Money Deposit (E.M.D.):** **(i) Tenders shall be accompanied with Earnest money of Rs. ..... in cash (up to Rs. 10,000/-) /Receipt Treasury Challan/Deposit at Call receipt of a scheduled bank/fixed deposit receipt of a scheduled bank/demand draft of a scheduled bank issued in favour of INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES. 50% of earnest money or Rs. 20 lakh, whichever is less, will have to be deposited in the shape prescribed above and balance amount of earnest money can be accepted in the form of Bank guarantee issued by a scheduled bank having validity for 6 months or more from the last date of receipt of tenders.** *(Pl. Refer SGF for blanks).* **(ii) The tender and the earnest money shall be placed in separate sealed envelopes, each marked "Tender" and "Earnest Money" respectively.** **iii) In cases where earnest money in cash is acceptable, the same shall be deposited with the Cashier of the Department and the receipt placed in the envelope meant for earnest money.** **iii) Both the envelopes shall be submitted together in another sealed envelope with the name of work and due date of opening written on envelope, which will be received by the..... up to ..... on..... and will be opened by him or his authorized representative in his office on the same day at ..... The envelope marked "Tender" of only those tenderers shall be opened, whose earnest money, placed in the other envelope, is found to be in order.** **NOTE:** EMD in the form of Cheques will not be accepted. *(Pl. Refer SGF for blanks)*	
2	**SECTION - 2: ITEM RATE TENDER & CONTRACT FOR WORKS**	
2.1	New para is added as second last para , Page 8 : I / We undertake and confirm that eligible similar work(s) has/ have not been got executed through another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/we shall be debarred for tendering in **ICTS/DCSEM** in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.	
3	**CONDITION OF CONTRACT**	
3.1	**Date of commencement of work –** The date of commencement of work shall be the date of start as specified in Schedule F or the 1st date of handing over of the site, whichever is later, in accordance with the phasing if any, as indicated in the tender document.	
4	**GENERAL CLAUSES OF CONTRACT (GCC)**	
4.1	In the event of the contract being determined **or rescinded** under provisions of any of the clause/ condition of the agreement, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of the DIRECTOR-ICTS.	
4.2	Clause 1A para 1, Page No. 13 The person(s) whose tender may be accepted (herein after called the contractor) shall permit Government at the time of making any payment to him for work done under the contract to deduct a sum at the rate of **10%** of the gross amount of each running bill till the sum along with the sum already deposited as earnest money, will amount to security deposit of 5%	

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	of the tendered value of the work. **Earnest money shall be adjusted first in the security deposit and further recovery of security deposit shall commence only when the up to date amount of security deposit starts exceeding the earnest money**. Such deductions @10% to make good the deficit
4.3	DEVIATION, EXTRA ITEMS AND PRICING : In the case of extra item (s) (items that are completely new, and are in addition to the items contained in the contract), the contractor may within fifteen days of receipt of order or occurrence of the item (s) claim rates, supported by proper analysis, for the work and the engineer-in-charge shall within one month of the receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.
4.9.2	In the case of substituted items (items that are taken up **with partial substitution or in lieu of items of work in the** contract) the rate for the agreement item (to be substituted) and substituted item shall also be determined in the manner as mentioned in the following para.
4.10	Carrying out part work at risk & cost of contractor : **If contractor:** i) At any time makes default during currency of work or does not execute any part of the work with due diligence and continues to do so even after a notice in writing of 7 days in this respect from the Engineer-in-Charge; **or** ii) Commits default in complying with any of the terms and conditions of the contract and does not remedy it or takes effective steps to remedy it within 7 days even after a notice in writing is given in that behalf by the Engineer-in-Charge; **or** iii) Fails to complete the work(s) or items of work with individual dates of completion, on or before the date(s) so determined, and does not complete them within the period specified in the notice given in writing in that behalf by the Engineer-in-Charge. The Engineer-in-Charge without invoking action under clause 3 may, without prejudice to any other right or remedy against the contractor which have either accrued or accrue thereafter to Government, by a notice in writing to take the part work/part incomplete work of any item(s) out of his hands and shall have powers to:(a) Take possession of the site and any materials, constructional plant, implements, stores, etc., thereon; **and/or**(b) Carry out the part work / part incomplete work of any item(s) by any means **at the risk and cost of the contractor**. The Engineer-in-Charge shall determine the amount, if any, is recoverable from the contractor for completion of the part work/ part incomplete work of any item(s) taken out of his hands and execute at the risk and cost of the contractor, the liability of contractor on account of loss or damage suffered by Government because of action under this clause shall not exceed 10% of the tendered value of the work. In determining the amount, credit shall be given to the contractor with the value of work done in all respect in the same manner and at the same rate as if it had been carried out by the original contractor under the terms of his contract, the value of contractor's materials taken over and incorporated in the work and use of plant and machinery belonging to the contractor. The certificate of the Engineer-in-Charge as to the value of work done shall be final and conclusive against the contractor provided always that action under this clause shall only be taken after giving notice in writing to the contractor. Provided also that if the expenses incurred by the department are less than the amount payable to the contractor at his agreement rates, the difference shall not be payable to the contractor. Any excess expenditure incurred or to be incurred by Government in completing the part work/ part incomplete work of any item(s) or the excess loss of damages suffered or may be suffered by Government as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to Government in law or per as agreement be recovered from any money due to the contractor or any account, and if such money is

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	insufficient, the contractor shall be called upon in writing and shall be liable to pay the same within 30 days. If the contractor fails to pay the required sum within the aforesaid period of 30 days, the Engineer-in-Charge shall have the right to sell any or all of the contractors' unused materials, constructional plant, implements, temporary building at site etc. and adjust the proceeds of sale thereof towards the dues recoverable from the contractor under the contract and if thereafter there remains any balance outstanding, it shall be recovered in accordance with the provisions of the contract. In the event of above course being adopted by the Engineer-in-Charge the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made any advance on any account or with a view to the execution of the work or the performance of the contract.".. 4.11 The contractor shall also abide by the provision of the Child labour (Prohibition & Regulation) Act - 1986. 4.12 No labour below 14 years: No labour below the age of 14 (fourteen) years shall be employed on the work. 4.13 LEVY/ TAXES PAYABLE BY CONTRACTOR: i) Sales Tax / VAT **(except Service Tax), Building and other Construction Workers Welfare Cess or any other tax or cess** in respect of this contract shall be payable by the contractor and Government shall not entertain any claim whatsoever in this respect. **However, in respect of service tax, same shall be paid by the contractor to the concerned department on demand and it will be reimbursed to him by the Engineer-in-Charge after satisfying that it has been actually and genuinely paid by the contractor.** (ii) The contractor shall deposit royalty and obtain necessary permit for supply of the red bajri, stone, kankar, etc. from local authorities. (iii) If pursuant to or under any law, notification or order any royalty, cess or the like becomes payable by the INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES TATA INSTITUTE OF FUNDEMENTAL RESEARCH and does not any time become payable by the contractor to the State Government, Local authorities in respect of any material used by the contractor in the works then in such a case, it shall be lawful to the INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES TATA INSTITUTE OF FUNDEMENTAL RESEARCH and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from dues of the contractor. (iv) Quoted rate shall be include obtaining neccesary liasoining, statuatory approval from the various departments like BDA/BBMP/BESCOM/BWSSB/ local authorities, etc. However government fees payable to respective department will be reimbursed again on production of valid reciept from the department. 4.14 **Clause 38:** Page 36 CONDITIONS FOR REIMBURSEMENT OF LEVY/TAXES IF LEVIED AFTER RECEIPT OF TENDERS: i) All tendered rates shall be inclusive of all taxes and levies **(except Service Tax)** payable under respective statutes. However, if any further tax or levy **or cess** is imposed by Statute, after the last stipulated date for the receipt of tender including extensions if any and the contractor thereupon necessarily and properly pays such taxes /levies /**cess,** the contractor shall be reimbursed the amount so paid, provided such payments, if any, is not, in the opinion of the Engineer-in-Charge (whose decision shall be final and binding on the contractor) attributable to delay in execution of work within the control of the contractor. (ii) The contractor shall keep necessary books of accounts and other

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	documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorized representative of the Government and/or the Engineer-in-Charge and shall **also** furnish such other information/document as the Engineer-in-Charge may require from time to time. (iii) The contractor shall, within a period of 30 days of the imposition of any such further tax or levy **or cess**, give a written notice thereof to the Engineer-in-charge that the same is given pursuant to this condition, together with all necessary information relating thereto.

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To,
ICTS
Bangalore.

Sub: Bank Details for Payment through Electronic Mode
Sir,

It is requested that our payment may please be arranged through Electronic Mode. The details of bank are as under:

1. IFSC CODE

2. NEFT Code

Note : *In case beneficiary's bank is State Bank of India (any branch in India) IFSC Code & NEFT Code may not be mentioned.*

3. Account No.

Full Account No. for payment to be made through Electronic Mode.

4. Account Type. CURRENT A/C (11)/CASH CREDIT A/C (13)

5. MICR NO.

Note : *1st three digit & last of 3 digit of MICR No. should not be zero.*

6. Name of Bank : ……

7. Name of Branch : ……

8. Address of Bank : ……

I hereby declare that the particulars given above are correct and complete. If the transaction is delayed or not effected at all for any reasons, I would not hold the user institution responsible and agree to discharge the responsibility expected of me as a participant under the scheme.

Yours faithfully,

( )
Signature of authorised Officer
With Name, Designation & Company's seal.

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SECTION - 1 : NOTICE INVITING TENDERS *

1. Sealed item rate tenders in the prescribed form are invited on behalf of the ICTS-DIRECTOR for the following:

*** :** Please refer ***"SALIENT GOVERNING FEATURES OF THE TENDER / WORK" (SGF)*** for blanks (issued with / as the tender)

TENDER NOTICE NO.: …….....….....

NAME OF WORK :.....		
Estimated Cost :Rs.....	E.M.D. Rs.....	Performance security / Security Deposit : …
Date of Sale From.....to.....	Cost of Tender Documents: Rs. ……(Non-refundable)	
Date of receipt of tenders and opening of Technical Bid :		
Time of Completion : .....…….Months		

2. Sale of tender documents: Tender documents consisting of the plans, drawings, specifications, schedule of quantities of the various classes of work to be executed, the set of terms and conditions of contract (to be complied with by the contractor whose tender may be accepted) and other necessary documents pertaining to the work will be open for inspection by the contracting agencies and which can be seen / purchased in the office of ……..…….. ***(Pl. Refer SGF).*** between 11.00 hrs. and 16.00 hrs., except on Saturdays, Sundays and Public Holidays, on production of the following credentials / documents:

a) Proof of registration with Government. / Semi Government organisations like CPWD, MES, Railways, State PWDs etc. in appropriate class OR having experience in execution of similar nature of works.

b) Annual turnover as per ITCC or profit & loss statement for the last 5 years. (Average annual turn over for the last 3 financial years should be atleast Rs. ……..). Not having incurred any loss in more than 2 years during last 5 years ending.

c) Experience of having successfully completed any of the following works during last **seven** years ending ……..……; (i) 3 similar works completed costing not less than Rs…… each; or (ii) 2 similar works completed costing not less than Rs…….. each; or (iii) 1 similar work completed costing not less than Rs. …….. ***(Pl. Refer SGF).***

NOTE*: The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to the last date of receipt of applications for tender.*

d) Latest Bank solvency certificate from any scheduled banks of Minimum Value of Rs……...

e) List of similar works in hand & works carried out by them for last 5 years indicating i) Agency for whom executed, ii) Value of work, iii) Completion time as stipulated and actual, or present position of the work.

f) List of construction plant, machinery, equipments, accessories & infrastructure facilities possessed by the agency to complete the work in time.

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g) List of Technical staff they possess.

h) Performance certificates; WCT registration certificate; PAN (Permanent Account Number).

Note: Similar works shall mean :…….. ***(Pl. Refer SGF).***

The Tender Documents can be purchased, during the period of sale, on payment of prescribed fee (non-refundable) paid in cash or in the form of pay order or crossed Demand draft from any of the scheduled banks, payable in favour of …….... A set of drawings, if specified, will be supplied alongwith tender documents, and it will be obligatory on the part of all the tenderers to return the tender drawings at the time of opening of tenders.

3. Submission of Tender & Opening: Tenders, which should always be placed in sealed envelope in single or two bids as specified in the NIT and submitted accordingly indicating SINGLE BID or FINANCIAL BID & TECHNICAL BID as the case may be and with the name of work and due date written on the envelopes, and the same shall be received upto 15.00 hours or as indicated in the NIT, in the office of the …….. . Unless otherwise specified, Technical Bids of the two bids tender will be opened on the same day at 15.30 hrs. (and Financial bids of the tender will be opened at a later date to be notified and communicated to the tenderers subsequently; or as indicated in the NIT), in the presence of tenderers who desire to be present. In case the date of receipt and opening of tender is declared holiday by INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES TATA INSTITUTE OF FUNDEMENTAL RESEARCH for any reason, the tenders will be received / opened on the next working day.

4. Completion period: The time allowed for carrying out the work shall be …… ***(Pl. Refer SGF).*** It shall be reckoned from 15th day of the date of issue of work order for works having stipulated time limit of more than 3 months and for all other works, it shall be reckoned from the date of issue of work order.

5. Earnest Money Deposit (E.M.D.) of Rs. ……..…….. ***in cash*** upto Rs.10,000/- in the form of *Department's receipt* / Demand Draft / Pay Order / Banker's cheque / Deposit at call receipt / Fixed Deposit Receipt (FDR), issued by a Scheduled Bank, drawn in favour of ……***(Pl. Refer SGF)***

NOTE: EMD in the form of Cheques will not be accepted. However, 50% of Earnest Money or Rs.20 Lakhs, whichever is less, will have to be deposited in the form prescribed above and balance amount of earnest money can be accepted in the form of Bank Guarantee (BG) issued by a Scheduled Bank.

6. Performance guarantee: The tenderer, whose tender is accepted, will be required to furnish performance guarantee of 5% of the tendered amount within the period specified in Schedule "F". This guarantee shall be in the form of Department's cash receipt (in case guarantee amount is less than Rs.10,000/-) or Deposit at call receipt / Demand Draft / Pay Order / Banker's cheque issued by a Scheduled Bank (in case guarantee amount is less than Rs.1,00,000/-) or Government Securities / Fixed Deposit Receipt (FDR) or Guarantee Bonds of any Scheduled Bank or The State Bank of India in accordance with the prescribed form.

7. Acceptance of Tender: The competent authority, on behalf of ICTS-DIRECTOR, does not bind himself to accept the lowest or any other tender, and reserves to himself the authority to reject any or all the tenders received, without assignment of any reason. All tenders, in which any of the prescribed condition is not fulfilled or any condition, including that of conditional rebates is put forth by the tenderer, shall be summarily rejected.

The Competent Authority, on behalf of the ICTS-DIRECTOR, reserves to himself the right of accepting the whole or any part of the tender and the tenderer shall be bound to perform the same at the rates quoted.

The officer inviting tenders shall have the right of rejecting all or any of the tenders and will not be bound to accept the lowest tender or any other tender.

8. Condition for tender submission: The tenderer shall give a list of both Gazetted and non-gazetted employees in ICTS, who are related to him. The contractor shall not be permitted to tender for works in the Department (responsible for award and execution of contracts) in which his near relative is posted as equivalent to Accounts Officer or as an officer in the capacity of grades Scientific Officer / "C" and above. He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relative to any gazetted officer in the . Any breach of this condition by the contractor would render him liable to be barred from tendering in this Department.

No Engineer of Gazetted rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES - TATA INSTITUTE OF FUNDEMENTAL RESEARCH is allowed to work as a contractor for a period of **one** year after his retirement from Government Services, with out the previous permission of the INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES - TATA INSTITUTE OF FUNDEMENTAL RESEARCH in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of the INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES - TATA INSTITUTE OF FUNDEMENTAL RESEARCH as aforesaid before submission of the tender or engagement in the contractor's service.

9. Validity of Tender: The tender for the work shall remain open for acceptance for a period of **120 days from the last date of submission of tenders**. If any tenderer withdraws his tender before the said period, or

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issue of Letter of Intent, whichever is earlier, or makes any modifications in the terms and conditions of the tender which are not acceptable to the Department, then the Government shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money absolutely. Further the tenderer shall not be allowed to participate in the re-tendering process of the work.

10. Site visit by the tenderer before tendering: Tenderers are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. A tenderer shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charges consequent on any misunderstanding or otherwise shall be allowed.

11. Tenderer's responsibilities: The tenderer shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a tenderer implies that he has read this notice & all other contract documents, and has made himself aware of the scope & specifications of the work to be done and local conditions and factors having a bearing on the execution of the work.

12. Tender documents & signing of contract: The Notice Inviting Tender shall form a part of the contract document. The successful tenderer / contractor, on acceptance of his tender by the Accepting Authority, shall, within 15 days from the stipulated date of start of the work, sign the contract consisting of : The Notice Inviting Tender, all the documents including all conditions, specifications and drawings, if any, forms the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.

12. Canvassing, either directly or indirectly, in connection with the tenders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection.

13. The terms 'Municipal Corporation, Electricity Boards etc. indicated in this tender shall also represent the 'Local statutory authority'/ 'State Govt.'/ 'Union Territory' etc., for works at different station.

Signature of the officer inviting tender
For and on behalf of the ICTS-DIRECTOR

SECTION - 2 : ITEM RATE TENDER & CONTRACT FOR WORKS

i)	Name of work:-	"Providing and constructing external Developmental works/Hardscape work for Discussion court in ICTS-TIFR Campus, Shivakote village, Bengaluru north".
ii)	Date & Time of submission	15: 00 hours on 03.11.2016
iii)	Date & Time of opening Technical bid	In presence of tenderers who may be present at 15:30 hours on 03.11.2016
iv)	Venue for submission & opening	*ICTS-TIFR Campus, Shivakote village, Bengaluru – 560089.*

TENDER DOCUMENTS ISSUED TO M/S. …….. ……
……

Project Engineer

Date of issue: **……**

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TENDER

I / We have read and examined the Notice Inviting Tender, Salient Governing Features of the Tender / Work including Schedules A, B, C, D, E & F, **Specifications Books *,** Drawings and Designs, General Rules & Directions, General Clauses of Contract, Special Clauses of Contract & other documents and rules referred to in the **Conditions and Clauses of Contract** and all other contents in the tender documents for the work.

(*** Note:** *The "Specifications / Conditions and Clauses of Contract books" are enclosed)*

These books, as required / specified in this "Salient Governing Feature of the Tender / Work" herein below, shall remain part of the tender documents / Contract / agreement to be executed, and signed by both the parties after acceptance of the Tender.

I / We, hereby tender for the execution of the work specified for the ICTS-DIRECTOR within the time specified in Schedule "F", viz., Schedule of Quantities and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to in Rule 1 of General Rules and Directions and in Clause - 11 of the General Clauses of Contract and with such materials as are provided for, by, and in respects in accordance with, such conditions so far as applicable.

We agree to keep the tender open for **one hundred twenty (120) days** from the last date of its submission and not to make any modifications in its terms and conditions.

A sum of **Rs.1.00 Lakhs** shall be deposited as Earnest Money as per stipulations in the NIT / Tender documents in the required format on demand from the Government. Consequent to the award of the subject work, If I / we, fail to furnish the prescribed performance guarantee within prescribed period, I / we agree that the said ICTS-DIRECTOR or his successors in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if I / we fail to commence work as specified, I / we agree that ICTS-DIRECTOR or his successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered, upto maximum of the percentage mentioned in Schedule "F" and those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form. Further, I / We agree that in case of forfeiture of earnest money or both Earnest Money & Performance Guarantee as aforesaid, I / We shall be debarred for participation in the re-tendering process of the work.

I / We hereby declare that I / We shall treat the tender documents, drawings and other records connected with the work as secret / confidential documents and shall not communicate information derived there-from to any person other than a person to whom I / We am / are authorised to communicate the same or use the information in any manner prejudicial to the safety of the State.

Signature of Contractor
Postal Address

Dated
Witness
Address
Occupation

Seal and Signature of Tenderer

A C C E P T A N C E

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me , ICTS for a sum of Rs...../- (Rupees.....
.....).

The letters referred to below shall form part of this contract Agreement.

i)

ii)

Signature
Designation

Dated ……..

Seal and Signature of Tenderer

SECTION-3 : GENERAL RULES AND DIRECTIONS

1. NIT & its contents: All works proposed for execution by contractor will be notified in a form of invitation to tender pasted in public places and signed by the officer inviting tender or by publication in News papers as the case may be.

This form will state the work to be carried out, as well as the date for submitting and opening tenders and the time allowed for carrying out the work, also the amount of earnest money to be deposited, and the amount of the security deposit and Performance guarantee to be deposited by the successful tenderer and the percentage, if any, to be deducted from the bills. Copies of the specifications, designs and drawings, schedule of quantities of the various descriptions of work and any other documents required in connection with the work signed for the purpose of identifications by the officer inviting tender shall also be open for inspection by the contractor at the office of officer inviting tender during office hours.

2. Signing of Tender and receipts for payments: In the event of the tender being submitted by a firm, it must be signed separately by each partner thereof or in the event of the absence of any partner, it must be signed on his behalf by a person holding a power-of-attorney authorising him to do so, such power of attorney to be produced with the tender, and it must disclose that the firm is duly registered under the Indian Partnership Act-1952.

Receipts for payments made on account of work, when executed by a firm, must also be signed by all the partners, except where contractors are described in their tender as a firm, in which case the receipts must be signed in the name of the firm by one of the partners, or by some other person having due authority to give effectual receipts for the firm.

3. Filling-up of tender: Any person who submits a tender shall fill up the usual printed form, stating at what rate he is willing to undertake each item of the work. Tenders, which propose any alteration in the work specified in the said form of invitation to tender, or in the time allowed for carrying out the work, or which contain any other condition of any sort, including conditional rebates, will be summarily rejected. No single tender shall include more than one work, but contractors who wish to tender for two or more works shall submit separate tender for each. Tenders shall have the name and number of the works to which they refer, written on the envelopes.

It will be obligatory on the part of the tenderer to sign all the pages of tender documents affixing his stamp. The tenders are to be on the prescribed form of ICTS. All rates shall be quoted on the proper form of the tender alone. All corrections shall be attested by the dated initials of the tenderer. Use of correcting fluid, anywhere in tender document is not permitted. Such tender is liable for rejection.

If it is found that the tender is not submitted in proper manner or contains too much corrections and/or absurd rates or amount, it would be open for the Government to take suitable disciplinary action against the Contractor.

4. Opening of tenders: The officer inviting tender or his duly authorised assistant will open tenders in the presence of any intending tenderers who may be present at the time, and will enter the amount of the several tenders in a Comparative Statement in a suitable form. In the event of a tender being accepted, a receipt for the earnest money shall thereupon be given to the tenderer who shall thereupon for the purpose of identifications sign copies of the specifications and other documents mentioned in Rule 1. In the event of a tender being rejected, the earnest money shall thereupon be returned to the tenderer remitting the same, without any interest.

5. Department's receipt for any money paid; The receipt of an accountant or clerk for any money paid by the tenderer will not be considered as any acknowledgment of payment to the officer inviting tender and the tenderer shall be responsible for seeing that he procures a receipt signed by the officer inviting tender or a duly authorised cashier.

6. Signing of Memorandum & Schedule of Materials: The memorandum of work tendered for and the schedule of materials to be supplied by the Department and their issue rates, shall be filled and completed in the office of the officer inviting tender before the tender form is issued. If a form is issued to an intending tenderer without having been so filled in and incomplete, he shall request the officer to have this done before he completes and delivers his tender.

7. Declaration by tenderer: The tenderers shall sign a declaration under the Official Secret Act-1923 for maintaining secrecy of the tender documents, drawings or other records connected with the work given to them. The unsuccessful tenderers shall return all the drawings given to them.

8. Guidelines for quoting the rates: All rates shall be quoted on the prescribed tender form. The amount for each item should be worked out and requisite totals given. Special care should be taken to write the rates in figures as well as in words, and the amount in figures only, in such a way that interpolation is not possible. The total amount should be written both in figures and in word. In case of figures, the words "Rs." should be written

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before the figures of rupees and word “P” after the decimal figures, e.g. “Rs. 2.15 P”. and in case of words, the word, “Rupees” should precede and the word “Paise” should be written at the end. Unless the rate is in whole rupees followed by the word 'only' it should invariably be upto two decimal places. While quoting the rate in schedule of quantities, the word 'only' should be written closely following the amount and it should not be written in the next line.

9. Quoted rates to includes all taxes: Sales tax, VAT, Purchase tax or any other tax on materials in respect of this contract, including state Sales tax and Turnover tax on transfer of property as per Works Contract Act etc. if any, shall be payable by the contractor and Government will not entertain any claim whatsoever in respect of the same.

As per the directives of the Sales Tax Authorities, the tax due at the rates notified by the State Government from time to time, shall be deducted from the bills payable to the Contractors, for which TDS certificate shall be issued by the Department.

10. Filling-up of Financial Bid: Unless otherwise called for, any tender containing percentage below / above the estimated cost put to tender is liable to be rejected. All rates shall be quoted on the tender form by the tenderers in figures and words shall be accurately filled in, so that there is no discrepancy in the rates written in figures and in words. The amount for each item should be worked out and requisite totals given. However,

i) The rate(s) must be quoted in decimal coinage. Amounts must be quoted in full rupees by ignoring fifty paise and considering more than fifty paise as rupee one.

ii) If a discrepancy is found, the rates which correspond with the amount worked out by the contractor shall, unless otherwise proved, be taken as correct.

iii) If the amount of an item is not worked out by the tenderer, or it does not correspond with the rate written either in figures or in words, then the rates quoted by the tenderer in words shall be taken as correct.

iv) Where the rate quoted by the tenderer in figures and in words tally but the amount is not worked out correctly, the rate quoted by the tenderer will, unless otherwise proved, be taken as correct and not the amount.

v) In event no rate has been quoted for any item(s), leaving space both in figure(s), word(s), and amount blank, it will be presumed that the contractor has included the cost of this / these item(s) in other items and rate for such item(s) will be considered as **zero** and work will be required to be executed accordingly.

11. Action in case of un realistic rates: In the case of any tender where unit rate of any item (s) appear unrealistic, such tender will be considered as unbalanced and in case the tenderer is unable to provide satisfactory explanation, such a tender is liable to be disqualified and rejected.

12. Furnishing of PG & SD on acceptance of Tender: The tenderer, whose tender is accepted, will be required to furnish performance guarantee of 5% of the tendered amount within the period specified in Schedule “F”. This guarantee shall be in the form of Department’s cash receipt (in case guarantee amount is less than Rs.10,000/-) or Deposit at call receipt / Demand Draft / Pay Order / Banker’s cheque issued by a Scheduled Bank (in case guarantee amount is less than Rs.1,00,000/-) or Government Securities / Fixed Deposit Receipt (FDR) or Guarantee Bonds of any Scheduled Bank or The State Bank of India in accordance with the prescribed form.

ii) The tenderer, whose tender is accepted, will also be required to furnish by way of Security Deposit for fulfillment of his contract, an amount equal to 5% of the tendered value of the work. The security deposit will be collected by deduction from the running bills of the contractors at the rates mentioned above and EMD deposited at the time of tender, will be treated as a part of the security deposit. The security amount will also be accepted in cash or in the shape of Government Securities. Fixed Deposit Receipt (FDR) of a Scheduled bank will also be accepted for this purpose, provided confirmatory advice is enclosed.

13. Contractor to depute his representative at site: The successful tenderer for the work should have responsible and responsive officer with adequate powers to take speedy decisions during the entire period of execution at the Work place. On acceptance of the tender, the name of the accredited representative(s) of the contractor, who would be responsible for taking instructions from the Engineer-in-Charge, shall be communicated in writing to the Engr-in-Charge.

14. Witnessing of a tender: The tender for the work shall not be witnessed by a contractor or contractors, who himself / themselves has / have tendered or who may and has / have tendered for the same work. Failure to observe this condition would render, tenders of the contractors tendering, as well as witnessing the tender, liable to summary rejection.

15. List of works in hand: The contractor shall submit list of works which are in hand / in progress in the following form:

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Name of work	Name & address of the establishment under whom the work is being executed	Value of the work	Completion time as per the contract	Position of the works in progress	Remarks
1	2	3	4	5	6

16. Returning of tender if not quoted: The tenderers not tendering for this work after purchase of the tender documents and drawings are advised to return the tender documents and drawings to the Officer Inviting the Tender, within 15 days from the due date of submission of tender. However, the cost of tender documents will not be refunded.

SECTION - 4 : CONDITIONS OF CONTRACT

DEFINITIONS :

1. The **'Contract'** means the documents forming the tender and acceptance thereof and the formal agreement executed between the Competent authority on behalf of the DIRECTOR-ICTS and the Contractor together with the documents referred to therein including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Engineer-in-charge and all these documents taken together, shall be deemed to form one contract and shall be complementary to one another.

2. In the contract the following expression shall, unless the context otherwise requires, have the meanings hereby respectively assigned to them.

i) The expression **'Works'** or **'Work'** shall, unless there be something either in the subject or context repugnant to such construction, be construed and taken to mean the works by or by virtue of the contract contracted to be executed whether temporary or permanent and whether original, altered, substituted or additional.

ii) The **'Site'** shall mean the land or other places on, into or through which work is to be executed under the contract or any adjacent land, path or street through which work is to be executed under the contract or any adjacent land, path or street which may be allotted or used for the purpose of carrying out the contract.

iii) The **'Contractor'** shall mean the individual, firm or company, whether incorporated or not, undertaking the works and shall include the legal personnel representative of such individual or the persons composing such firm or company or the successors of such firm or company and the permitted assignees of such individual, firm or company.

iv) The **'DIRECTOR-ICTS'** means the DIRECTOR-ICTS and his successors.

v) The **'Engineer-in-Charge'** means the Engineer / Officer, who shall supervise and be in charge of the work and who shall sign the contract on behalf of the DIRECTOR-ICTS as mentioned in Schedule "F" hereunder.

vi) **'Government'** or **'INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES TATA INSTITUTE OF FUNDEMENTAL RESEARCH'** shall mean the DIRECTOR-ICTS

vii) **'Temporary Work'** means all temporary works of every kind required in or about the execution, completion and maintenance of the works.

viii) **'Accepting authority'** shall mean the authority mentioned in Schedule "F".

(ix) **Excepted Risk** are risks due to riots (other than those on account of contractor's employees), war (whether declared or not) invasion, act of foreign enemies, hostilities, civil war, rebellion revolution, insurrection, military or usurped power, any acts of Government, damages from aircraft, acts of God, such as earthquake, lightening and unprecedented floods, and other causes over which the contractor has no control and accepted as such by the Accepting Authority or causes solely due to use or occupation by Government of the part of the works in respect of which a certificate of completion has been issued or a cause solely due to Government's faulty design of works.

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(x) **Market Rate** shall be the rate as decided by the Engineer-in-Charge on the basis of the cost of materials and labour at the site where the work is to be executed plus the percentage mentioned in Schedule `F' to cover, all overheads and profits.

(xi) **Schedule(s)** referred to in these conditions shall mean the relevant schedule(s) annexed to the tender papers.

(xii) **Department** means or any of its Unit (s) of INTERNATIONAL CENTRE FOR THEORETICAL SCIENCES TATA INSTITUTE OF FUNDEMENTAL RESEARCH which invites tenders on behalf of DIRECTOR-ICTS as specified in schedule `F'.

(xiii) **District Specifications** means the specifications followed by the State Government in the area where the work is to be executed.

(xiv) **Tendered value** means the value of the entire work as stipulated in the letter of award.

3. **Scope and Performance:** Where the context so requires, words imparting the singular only also include the plural and vice versa. Any reference to masculine gender shall whenever required include feminine gender and vice versa.

4. Headings to these General / Special Clauses of Contract shall not be deemed to form part thereof or be taken into consideration in the interpretation or construction thereof or of the contract.

5. The contractor shall be furnished, free of cost one certified copy of the contract documents except standard specifications, Schedule of quantities and such other printed and published documents, together with all drawings as may be forming part of the tender papers. None of these documents shall be used for any purpose other than that of this contract.

6. Works to be Carried out: The work to be carried out under the Contract shall, except as otherwise provided in these conditions, include all labour, materials, tools, plants, equipment and transport which may be required in preparation of and for and in the full and entire execution and completion of the works. The descriptions given in the Schedule of Quantities (Schedule-A) shall, unless otherwise stated, be held to include wastage on materials, carriage and cartage, carrying and return of empties, hoisting, setting, fitting and fixing in position and all other labours necessary in and for the full and entire execution and completion of the work as aforesaid in accordance with good practice and recognised principles.

7. Sufficiency of Tender: The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the rates and prices quoted in the Schedule of Quantities, which rates and prices shall, except as otherwise provided, cover all his obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the works.

8. Discrepancies and Adjustment of Errors: The several documents forming the Contact are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale drawing and figured dimensions in preference to scale and Special Clauses in preference to General Clauses.

8.1 **In the case of discrepancy** between the schedule of Quantities, the Specifications and / or the drawings, the following order of preference shall be observed :-

(i) Description of Schedule of Quantities.

(ii) Particular Specifications and Special Clauses, if any.

(iii) Drawings.

(iv) Departmental Specifications

(v) C.P.W.D. Specifications.

(vi) Indian Standard Specifications of B.I.S.

8.2 If there are varying or conflicting provisions made in any one document forming part of the contract, the Accepting Authority shall be the deciding authority with regard to the intention of the document and his decision shall be final and binding on the contractor.

8.3 Any error in description, quantity or rate in Schedule of Quantities or any omission therefrom shall not vitiate the contract or release the Contractor from the execution of the whole or any part of the works

comprised therein according to drawings and specifications or from any of his obligations under the contract. the works

9. Signing of Contract: The successful tenderer / contractor, on acceptance of his tender by the Accepting Authority, shall, within 15 days from the stipulated date of start of the work, sign the contract consisting of :

(i) The notice inviting tender, all the documents including drawings, if any, forming the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.

(ii) Standard ICTS Form as mentioned in Schedule `F' consisting of :

a. Various standard clauses with corrections upto the date stipulated in Schedule `F' alongwith annexures thereto.

b. ICTS Safety Code.

c. Model Rules for the protection of health, sanitary arrangements for workers employed by ICTS or its contractors.

d. ICTS Contractor's Labour Regulations.

e. List of Acts and omissions for which fines can be imposed.

(iii) No payment for the work done will be made unless contract is signed by the contractor.

Seal and Signature of Tenderer

SECTION - 5 : CLAUSES OF CONTRACT

SECTION – 5 (j) : GENERAL CLAUSES OF CONTRACT (GCC)

CLAUSE 1 : PERFORMANCE GUARANTEE

i) The contractor shall submit an irrevocable Performance Guarantee of 5% (Five percent) of the tendered amount in addition to other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement, (not withstanding and / or without prejudice to any other provisions in the contract) within period specified in **Schedule "F"** from the date of issue of letter of acceptance. This period can be further extended by the Engineer-in-charge upto a maximum period as specified in **Schedule "F"** on written request of the contractor stating the reason for delays in procuring the Performance Guarantee, to the satisfaction of the Engineer-in-charge.

This guarantee shall be in the form of Department's cash receipt (in case guarantee amount is less than Rs.10,000/-) or Demand Draft / Pay Order / Banker's cheque / Deposit at call receipt issued by a Scheduled Bank (in case guarantee amount is less than Rs.1,00,000/-) or Government Securities / Fixed Deposit Receipt (FDR) or Guarantee Bonds (BG) of any Scheduled Bank or The State Bank of India in accordance with the form annexed as **Section-10(i)** hereto. In case a fixed deposit receipt of any Bank is furnished by the contractor to the Government as part of the performance guarantee and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the Government to make good the deficit.

ii) The Performance Guarantee shall be initially valid upto the stipulated date of completion plus 60 days beyond that. In case the time for completion of work gets enlarged, the contractor shall get the validity of performance Guarantee extended to cover such enlarged time for completion of work. After recording of the completion certificate for the work by the competent authority, the performance guarantee shall be returned to the contractor, without any interest.

iii) The Engineer-in-charge shall not make a claim under the Performance guarantee except for amounts to which the DIRECTOR-ICTS is entitled under the contract (notwithstanding and / or without prejudice to any other provisions in the contract agreement) in the event of :

(a) Failure by the contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Engineer-in-charge may claim the full amount of the Performance guarantee.

(b) Failure by the contractor to pay DIRECTOR-ICTS any amount due, either as agreed by the contractor or determined under any of the Clauses / Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer-in-charge.

iv) In the event of the contract being determined under provisions of any of the clause / condition of the agreement, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of the DIRECTOR-ICTS.

CLAUSE 1-A: RECOVERY OF SECURITY DEPOSIT :

The person(s) whose tender may be accepted (hereinafter called the contractor) shall permit Government at the time of making any payment to him for work done under the contract to deduct a sum at the rate of 5% of the gross amount of each running bill till the sum alongwith the sum already deposited as earnest money, will amount to security deposit of 5% of the tendered value of the work. Such deductions will be made and held by Government by way of Security Deposit unless he has / they have deposited the amount of Security at the rate mentioned above in cash or in the form of Government Securities or Fixed Deposit Receipts. In case a fixed deposit receipt of any bank is furnished by the contractor to the Government as part of the security deposit and the bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the Government to make good the deficit.

All compensation or the other sums of money payable by the contractor under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising therefrom, or from any sums which may be due to or may become due to the contractor by Government or any account whatsoever and in the event of his Security Deposit being reduced by reason of any such deductions or sale as aforesaid, the contractor shall within 10 days make good in cash or fixed deposit receipt tendered by the State Bank of India or by scheduled banks or Government Securities (if deposited for more than 12 months) endorsed in favour of the Officer inviting the tender / his representative in the office, any sum or sums which may have been deducted from, or raised by sale of his security deposit or any part thereof. The security deposit shall

be collected from the running bills of the contractor at the rates mentioned above and the Earnest Money deposited at the time of tenders will be treated as part of the Security Deposit.

Security Deposit as deducted above can be released against Bank Guarantee issued by a Scheduled Bank on its accumulation to a minimum of Rs.5 Lakhs subject to the condition that amount of such Bank Guarantee, except last one, shall not be less than Rs.5 Lakhs.

NOTE 1 : Government papers tendered as security will be taken at 5% (five per cent) below its market price or at its face value, whichever is less. The market price of Government papers would be ascertained by the Engineer-in-charge at the time of collection of interest and the amount of interest to the extent of deficiency in value of the Government paper will be withheld if necessary.

NOTE 2 : Government Securities will include all forms of securities mentioned in Rule No. 274 of the G.F. Rules except fidelity bond. This will be subject to the observance of the condition mentioned under the rule against each form of security.

NOTE 3 : Note 1 & 2 above shall be applicable for both Clauses 1 & 1A..

CLAUSE 2 : COMPENSATION FOR DELAY :

If the contractor fails to maintain the required progress in terms of clause-5 or to complete the work and clear the site on or before the contract or extended date of completion, he shall, without prejudice to any other right or remedy available under the Law to the Govt. on account of such breach, pay as agreed compensation the amount calculated at the rate stipulated below as the authority specified in Schedule “F” (whose decision in writing shall be final and binding) may decide on the amount of tendered value of the work for every completed day / month (as applicable) that the progress remains below that specified in Clause-5 or that the work remains incomplete.

This will also apply to items or group of items for which a separate period of completion has been specified. :

i) Compensation for delay of work: @ 1.5% per month of delay to be computed on per day basis.

Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed 10% of the tendered value of work or of the tendered value of the item or group of items of work for which a separate period of completion is originally given.

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the Government. In case, the contractor does not achieve a particular milestone mentioned in Schedule “F”, or the re-scheduled milestone(s) in terms of Clause 5.4, the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied at the final grant of Extension of Time. With-holding of this amount on failure to achieve a milestone, shall be automatic without any notice to the contractor. However, if the contractor catches up with the progress of work on the subsequent mitestone (s), the withheld amount shall be released. In case the contractor fails to make up for the delay in subsequent milestone(s), amount mentioned against each milestone missed subsequently also shall be withheld. However, no interest, whatsoever, shall be payable on such withheld amount.

CLAUSE 3 : WHEN CONTRACT CAN BE DETERMINED : POWERS OF ENGINEERS-IN-CHARGE:

Subject to other provisions contained in this clause, the Engineer-in-Charge may, without prejudice to his any other right or remedy against the contractor in respect of any delay, inferior workmanship, any claim for damages and / or any other provisions of this contract or otherwise, and whether the date for completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases:

i) If the contractor having been given by the Engineer-in-Charge a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or un-workman-like manner shall omit to comply with the requirements of such notice for a period of 7 days thereafter.

ii) if the contractor has, without reasonable cause, suspended the progress of the work or has failed to proceed with the work with due diligence so that in the opinion of the Engineer-in-Charge (which shall be final and binding) he will be unable to secure completion of the work by the date for completion and continue to do so after a notice in writing of 7 days from the Engineer-in-Charge.

iii) If the contractor fails to complete the work within the stipulated date or items of work with individual date of completion, if any stipulated, on or before such date(s) of completion and does not complete them within the period specified in a notice given in writing in that behalf by the Engineer-in-Charge.

(iv) If the contractor persistently neglects to carry out his obligations under the contract and / or commits default in complying with any of the terms and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Engineer-in-Charge.

(v) If the contractor shall offer or give or agree to give to any person in Government service or to any other person on his behalf any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of this or any other contract for Government.

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(vi) If the contractor shall enter into a contract with Government in connection with which commission has been paid or agreed to be paid by him or to his knowledge, unless the particulars of any such commission and the terms of payment thereof have been previously disclosed in writing to the Engineer-in-Charge.

(vii) If the contractor shall obtain a contract with Government as a result of wrong tendering or other non-bonafide methods of competitive tendering.

(viii) If the contractor being an individual, or if a firm, any partner thereof shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any proceedings for liquidation or composition (other than a voluntary liquidation for the purpose of amalgamation or reconstruction) under any Insolvency Act for the time being in force or make any conveyance or assignment of his effects or composition or arrangement for the benefit of his creditors or purport so to do, or if any application be made under any Insolvency Act for the time being in force for the sequestration of his estate or if a trust deed be executed by him for benefit of his creditors.

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

(x) If the contractor shall suffer an execution being levied on his goods and allow it to be continued for a period of 21 days.

(xi) If the contractor assigns, transfers, sublets (engagement of labour on a piece-work basis or of labour with materials not to be incorporated in the work, shall not be deemed to be subletting) or otherwise parts with or attempts to assign, transfer, sublet or otherwise parts with the entire works or any portion thereof without the prior written approval of the Engineer-in-Charge.

(xii) If the work is not started by the contractor within l / 8th of the stipulated time.

When the contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge on behalf of the DIRECTOR-ICTS shall have powers:

a) To determine the contract as aforesaid (of which termination notice in writing to the contractor under the hand of the Engineer-in-Charge shall be conclusive evidence). Upon such determination, the Earnest Money Deposit, Security Deposit already recovered and Performance Guarantee under the contract, shall be liable to be forfeited, and shall be absolutely at the disposal of the Government.

b) After giving notice to the contractor to measure up the work of the contractor and to take such whole, or the balance or part thereof, as shall be unexecuted out of his hands and to give it to another contractor to complete the work. The contractor, whose contract is determined as above, shall not be allowed to participate in the tendering process for the balance work.

In the event of above courses being adopted by the Engineer-in-Charge, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. And in case action is taken under any of the provisions aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this contract unless and until the Engineer-in-Charge has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

CLAUSE 3A : Closure of Contract on non-commencement of work: In case the work cannot be started due to reasons not within the control of the contractor within 1/8th of the stipulated time for completion of work, either party may close the contract. In such eventuality, the Earnest Money Deposit and the Performance Guarantee of the contractor shall be refunded, but no payment on account of interest, loss of profit or damages etc. shall be payable at all.

CLAUSE 4 : Contractor liable to pay compensation even if action not taken under Clause 3:

In any case in which any of the powers conferred upon the Engineer-in-Charge by clause 3 thereof, shall have become exercisable and the same are not exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the contractor and the liability of the contractor for compensation shall remain unaffected. In the event of the Engineer-in-Charge putting in force all or any of the powers vested in him under the preceding clause he may, if he so desires after giving a notice in writing to the contractor, take possession of (or at the sole discretion of the Engineer-in-Charge which shall be final and binding on the contractor) use as on hire (the amount of the hire money being also in the final determination of the Engineer-in-Charge) all or any tools, plant, materials and stores, in or upon the works, or the site thereof, belonging to the contractor, or procured by the contractor and intended to be used for the execution of the work / or any part thereof, paying or allowing for the same in account at the contract rates, or, in the case of these not being applicable, at current market rates to be certified by the Engineer-in-Charge, whose certificate thereof shall be final and binding on the contractor, his clerk of the works, foreman or other authorised agent to remove such tools, plant, materials, or stores from the premises (within a

time to be specified in such notice); in the event of the contractor failing to comply with any such requisition, the Engineer-in-Charge may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and at his risk in all respects and the certificate of the Engineer-in-Charge as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the contractor.

CLAUSE 5 : TIME AND EXTENSION FOR DELAY:

The time allowed for execution of the works as stipulated in the **Schedule "F"**, or the extended time in accordance with these conditions shall be the essence of the Contract. The execution of the works shall commence from such time period as mentioned in **Schedule "F"** or from the date of handing over of the site whichever is later. If the Contractor commits default in commencing the execution of the work as aforesaid, Government shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the earnest money & performance guarantee absolutely.

5.1 As soon as possible after the Contract is concluded, the Contractor shall submit a Time and Progress Chart for each mile stone and get it approved by the Department. The Chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessary by agreement between the Engineer-in-Charge and the Contractor within the limitations of time imposed in the Contract documents, and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed for any work, exceeds one month (save for special jobs for which a separate programme has been agreed upon) to complete the work as per mile stones given in **Schedule "F".**

5.2 If the work(s) be delayed by:

i	Force majeure, or
ii	abnormally bad weather, or
iii	serious loss or damage by fire, or
iv	civil commotion, local commotion of workmen, strike or lock out, affecting any of the trades employed on the work, or
v	delay on the part of other contractors or tradesmen engaged by Engineer-in-Charge in executing work not forming part of the Contract, or
vi	non-availability of stores, which are the responsibility of Government to supply or
vii	non-availability or break down of tools and plant to be supplied or supplied by Government or
viii	any other cause which, in the absolute discretion of the Engineer-in-Charge is beyond the Contractor`s control.

then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer-in-Charge but shall nevertheless use constantly his best endeavors to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in-Charge to proceed with the works.

5.3 Request for rescheduling of Mile stones and extension of time, to be eligible for consideration, shall be made by the Contractor in writing within 14 days of the happening of the event causing delay on the prescribed form. The Contractor may also, if practicable, indicate in such a request the period for which extension is desired.

5.4 In any such case the Engineer-in-Charge may give a fair and reasonable extension of time and reschedule the mile stones for completion of work. Such extension shall be communicated to the Contractor by the Engineer-in-Charge in writing, within 3 months of the date of receipt of such request. Non application by the contractor for extension of time shall not be a bar for giving a fair and reasonable extension by the Engineer-in-Charge and this shall be binding on the contractor.

CLAUSE 6 : MEASUREMENTS OF WORK DONE :

Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement, the value in accordance with the contract of work done.

All measurement of all items having financial value shall be entered in Measurement Book and/or level field book so that a complete record is obtained of all works performed under the contract.

All measurements and levels shall be taken jointly by the Engineer-in-Charge or his authorised representative and by the contractor or his authorised representative from time to time during the progress of the work and such measurements shall be signed and dated by the Engineer-in-Charge and the contractor or their representatives in token of their acceptance. If the contractor objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by both the parties.

If for any reason the contractor or his authorised representative is not available and the work of recording measurements is suspended by the Engineer-in-Charge or his representative, the Engineer-in-Charge and the

Department shall not entertain any claim from contractor for any loss or damages on this account. If the contractor or his authorised representative does not remain present at the time of such measurements after the contractor or his authorised representative has been given a notice in writing three (3) days in advance or fails to countersign or to record objection within a week from the date of the measurement, then such measurements recorded in his absence by the Engineer-in-Charge or his representative shall be deemed to be accepted by the Contractor.

The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for measurements and recording levels.

Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available, then a mutually agreed method shall be followed.

The contractor shall give, not less than 7 days notice to the Engineer-in-Charge or his authorised representative in-charge of the work, before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorised representative in-charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of measurements without such notice having been given or the Engineer-in-Charge's consent being obtained in writing, the same shall be uncovered at the Contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

Engineer-in-Charge or his authorised representative may cause either themselves or through another officer of the department to check the measurements recorded jointly or otherwise as aforesaid and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.

It is also a term of this contract that recording of measurements of any item of work in the measurement book and/or its payment in the interim, on account or final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defects liability period.

CLAUSE 6-A : COMPUTERISED MEASUREMENT BOOKS:

Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement the value of work done in accordance with the contract. All measurements of all items having financial value shall be entered by the contractor and compiled in the shape of the Computerized Measurement Book having pages of A-4 size as per the format of the department so that a complete record is obtained of all the items of works performed under the contract.

All such measurements and levels recorded by the contractor or his authorized representative from time to time, during the progress of the work, shall be got checked by the contractor from the Engineer-in-Charge or his authorised representative as per interval or program fixed in consultation with Engineer-in-Charge or his authorized representative. After the necessary corrections made by the Engineer-in-Charge, the measurement sheets shall be returned to the contractor for incorporating the corrections and for resubmission to the Engineer-in-Charge for the dated signatures by the Engineer-in-Charge and the contractor or their representatives in token of their acceptance.

Whenever bill is due for payment, the contractor would initially submit draft computerized measurement sheets and these measurements would be got checked / test checked from the Engineer-in-Charge and/or his authorized representative. The contractor will, thereafter, incorporate such changes as may be done during these checks/test checks in his draft computerized measurements, and submit to the department a computerized measurement book, duly bound, and with its pages machine numbered. The Engineer-in-Charge and/or his authoirsed representative would thereafter check this MB, and record the necessary certificates for their checks / test checks.

The final, fair, computerized measurement book given by the contractor, duly bound, with its pages machine numbered, should be 100% correct, and no cutting or over-writing in the measurements would thereafter be allowed. If at all any error is noticed, the contractor shall have to submit a fresh computerized MB with its pages duly machine numbered and bound, after getting the earlier MB cancelled by the department. Thereafter, the MB shall be taken in the Office records, and allotted a number as per the Register of Computerised MBs. This should be done before the corresponding bill is submitted in the Office for payment. The contractor shall submit one spare copy of such computerized MB for the purpose of reference and record by the various officers of the department.

The contractor shall also submit to the department separately his computerized Abstract of Cost and the bill based on these measurements, duly bound, and its pages machine numbered alongwith one spare copy of the bill. Thereafter, this bill will be processed by the Office and allotted a number as per the computerized record in the same way as is done for the measurement book meant for measurements.

The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for checking of measurements / levels by the Engineer-in-Charge or his representative.

Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available then a mutually agreed method shall be followed.

The contractor shall give not less than seven days notice to the Engineer-in-Charge or his authorised representative in charge of the work before covering up or otherwise placing beyond the reach of checking and/or test checking the measurement of any work in order that the same may be checked arid/or test checked and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of checking and/or test checking measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorised representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of checking and/or test checking measurements without such notice having been given or the Engineer-in-Charge's consent being obtained in writing, the same shall be uncovered at the Contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

Engineer-in-Charge or his authorised representative may cause either themselves or through another officer of the department to check the measurements recorded by contractor and all provisions stipulated herein above shall be applicable to such checking of measurements or levels. It is also a term of this contract that checking and/or test checking the measurements of any item of work in the measurement book and/or its payment in the interim, on account of final bill shall not be .considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defects liability period.

CLAUSE 7 : PAYMENT ON INTERMEDIATE CERTIFICATE TO BE REGARDED AS ADVANCES :

No payment shall be made for work estimated to cost Rs.20,000/- or less till after the whole of the work shall have been completed and certificate of completion given. For works estimated to cost over Rs.20,000/-, the interim or running account bill shall be submitted by the contractor for the work executed on the basis of such recorded measurements on the format of the Department in triplicate on or before the date of every month fixed for the same by the Engineer-in-Charge. The contractor shall not be entitled to be paid any such interim payment if the gross work done together with net payment / adjustment of advances for material collected, if any, since the last such payment is less than the amount specified in Schedule “F”, in which case the interim bill shall be prepared on the appointed date of the month after the requisite progress is achieved. Engineer-in-Charge shall arrange to have the bill verified by taking or causing to be taken, where necessary, the requisite measurement of the work. In the event of the failure of the contractor to submit the bills, Engineer-in-Charge shall prepare or cause to be prepared such bills in which event no claims whatsoever due to delays on payment including that of interest shall be payable to the contractor. Payment on account of amount admissible shall be made by the Engineer-in-Charge certifying the sum to which the contractor is considered entitled by way of interim payment at such rates as decided by the Engineer-in-Charge. The amount admissible shall be paid by 10th working day after the day of presentation of the bill by the Contractor to the Engineer-in-Charge or his representative together with the account of the material issued by the department, or dismantled materials, if any. In the case of works outside the headquarters of the Engineer-in-Charge, the period of 10 working days will be extended to 15 working days.

All such interim payments shall be regarded as payment by way of advances against final payment only and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be rejected, removed, taken away and reconstructed or re-erected. Any certificate given by the Engineer-in-Charge relating to the work done or materials delivered forming part of such payment, may be modified or corrected by any subsequent such certificate(s) or by the final certificate and shall not by itself be conclusive evidence that any work or materials to which it relates is/are in accordance with the contract and specifications. Any such interim payment, or any part thereof shall not in any respect conclude, determine or affect in any way powers of the Engineer-in-Charge under the contract or any of such payments be treated as final settlement and adjustment of accounts or in any way vary or affect the contract.

Pending consideration of extension of date of completion, interim payments shall continue to be made as herein provided without prejudice to the right of the department to take action under the terms of this contract for delay in the completion of work, if the extension of date of completion is not granted by the competent authority.

The Engineer-in-Charge jn his sole discretion on the basis of a certificate from his representative to the effect that the work has been completed upto the level in question make interim advance payments without detailed measurements for work done (other than foundations, items to be covered under finishing items) upto lintel level (including sunshade etc.) and slab level, for each floor working out at 75% of the assessed value. The advance payments so allowed shall be adjusted in the subsequent interim bill by taking detailed measurements thereof.

CLAUSE 8 : COMPLETION CERTIFICATE & COMPLETION PLANS :

Within ten days of the completion of the work, the contractor shall give notice of such completion to the Engineer-in-Charge and within thirty days of the receipt of such notice, the Engineer-in-Charge shall inspect the work, and if there is no defect in the work, shall furnish the contractor with a certificate of completion, otherwise a provisional certificate of physical completion indicating defects (a) to be rectified by the contractor and / or (b) for which payment will be made at reduced rates, shall be issued. But no final certificate of completion shall be issued, nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall be executed, all scaffolding, surplus materials, rubbish and all huts and sanitary arrangements, required for his/their work people on the site in connection with the execution of the works as shall have been erected or constructed by the contractor(s) and cleaned off the dirt from all wood work, doors, windows, walls, floors or other parts the building, in, upon, or about which the work is to be executed or of which he may have had possession for the purpose of the execution thereof, and not until the work shall have been measured by the Engineer-in-Charge. If the contractor shall fail to comply with the requirements of this clause as to removal of scaffolding, surplus materials and rubbish and all huts and sanitary arrangements as aforesaid and cleaning off dirt on or before the date fixed for the completion of the work, the Engineer-in-Charge may at the expense of the contractor remove such scaffolding, surplus materials and rubbish, etc., and dispose off the same as he thinks fit and clean off such dirt as aforesaid; and the contractor shall have no claim in respect of scaffolding or surplus materials as aforesaid except for any sum actually realised by the sale thereof.

8. A : CONTRACTOR TO KEEP SITE CLEAN : When the annual repair and maintenance of works are carried out, the splashes and droppings from white washing, colour washing, painting etc. on wall, floors, doors, windows etc. shall be removed and the surface cleaned simultaneously with the completion of these items of work in the individual rooms, quarters or premises etc. where the work is done without waiting for the actual completion of all the other items of work in contract. In case the contractor fails to comply with the requirements of this clause, the Engineer-in-Charge shall have the right to get this work done at the cost of the contractor either departmentally or through any other agency. Before taking such action, the Engineer-in-Charge shall give **10** days notice in writing to the contractor.

8. B : Completion Plans TO BE SUBMITTED BY THE CONTRACTOR: The contractor shall submit completion plan required as per Specifications for Electrical works as applicable within 30 days of the completion of the work.

In case, the contractor fails to submit the completion plan as aforesaid, he shall be liable to pay a sum equivalent to 2.50% of the value of the work subject to a ceiling of Rs.15,000/- as may be fixed by the Engineer-in-Charge and in this respect the decision of the Engineer-in-Charge shall be final and binding on the contractor.

CLAUSE 9 : PAYMENT OF FINAL BILL:

The final bill shall be submitted by the contractor in the same manner as specified in interim bills within three months of physical completion of the work or within one month of the date of the final certificate of completion furnished by the Engineer-in-Charge whichever is earlier. No further claims shall be made by the contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payments of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by Engineer-in-Charge, will, as far as possible be made within the period specified herein-under, the period being reckoned from the date of receipt of the bill by the Engineer-in-Charge or his authorised representative, complete with account of materials issued by the Department and dismantled materials.

(i) If the Tendered value of work is upto Rs. 15 lakhs, 3 months
(ii) If the Tendered value of work exceeds Rs. 15 lakhs 6 months

CLAUSE 9A : PAYMENT OF CONTRACTOR'S BILLS TO BANKS:

Payments due to the contractor may, if so desired by him, be made to his bank, registered financial co-operative or thrift societies or recognized financial institutions instead of direct to him provided that the contractor furnishes to the Engineer-in-Charge (1) an authorisation in the form of a legally valid document such as a power of attorney conferring authority on the bank registered financial co-operative or thrift societies or recognized financial institutions to receive payments and (2) his own acceptance of the correctness of the amount made out as being due to him by Government or his signature on the bills or other claim preferred against Government before settlement by the Engineer-in-Charge of the account or claim by payment to the bank registered financial co-operative or thrift societies or recognized financial institutions. While the receipt given by such banks registered financial co-operative or thrift societies or recognized financial institutions shall constitute a full and sufficient discharge for the payment, the contractor shall wherever possible present his bills duly receipted and discharged through his bank, registered financial co-operative or thrift societies or recognized financial institutions.

Nothing herein contained shall operate to create in favour of the bank registered financial co-operative or thrift societies or recognized financial institutions any rights or equities vis-a-vis the DIRECTOR-ICTS .

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CLAUSE 10 : MATERIALS SUPPLIED BY GOVERNMENT : Materials which Government will supply are shown in **Schedule 'B'** which also stipulates quantum, place of issue and rate(s) to be charged in respect thereof. The contractor shall be bound to procure them from the Engineer-in-Charge.

As soon as the work is awarded, the contractor shall finalise the programme for the completion of work as per clause 5 of this contract and shall give his estimates of materials required on the basis of drawings/or schedule of quantities of the work. The Contractor shall give in writing his requirement to the Engineer-in-Charge which shall be issued to him keeping in view the progress of work as assessed by the Engineer-in-Charge, in accordance with the agreed phased programme of work indicating monthly requirements of various materials. The contractor shall place his indent in writing for issue of such materials at least 7 days in advance of his requirement.

Such materials shall be supplied for the purpose of the contract only and the value of the materials so supplied at the rates specified in the aforesaid schedule shall be set off or deducted, as and when materials are consumed in items of work (including normal wastage) for which payment is being made to the contractor, from any sum then due or which may therefore become due to the contractor under the contract or otherwise or from the security deposit. At the time of submission of bills, the contractor shall certify that balance of materials supplied is available at site in original good condition.

The contractor shall submit alongwith every running bill (on account or interim bill) material-wise reconciliation statements supported by complete calculations reconciling total issue, total consumption and certified balance (diameter/section-wise in the case of steel) and resulting variations and reasons therefore. Engineer-in-Charge shall (whose decision shall be final and binding on the contractor) be within his rights to follow the procedure of recovery in clause 42 at any stage of the work if reconciliation is not found to be satisfactory

The contractor shall bear the cost of getting the material issued, loading, transporting to site, unloading, storing under cover as required, cutting assembling and joining the several parts together as necessary. Not withstanding anything to the contrary contained in any other clause of the contract and all stores/materials so supplied to the contractor or procured with the assistance of the Government shall remain the absolute property of Government and the contractor shall be the trustee of the stores/materials, and the said stores/materials shall not be removed/disposed off from the site of the work on any account and shall be at all times open to inspection by the Engineer-in-Charge or his authorised agent. Any such stores/materials remaining unused shall be returned to the Engineer-in-Charge in as good as condition in which they were originally supplied at a place directed by him, at a place of issue or any other place specified by him as he shall require, but in case it is decided not to take back the stores/materials, the contractor shall have no claim for compensation on any account of such stores/materials so supplied to him as aforesaid and not used by him or for any wastage in or damage to in such stores / materials.

On being required to return the stores/materials, the contractor shall hand over the stores/ materials on being paid or credited such price as the Engineer-in-Charge shall determine, having due regard to the condition of the stores/materials. The price allowed for credit to the contractor, however, shall be at the prevailing market rate not exceeding the amount charged to him, excluding the storage charge, if any. The decision of the Engineer-in-Charge shall be final and conclusive. In the event of breach of the aforesaid condition, the contractor shall in addition to throwing 'himself open to account for contravention of the terms of the licences or permit and/or for criminal breach of trust, be liable to Government for all advantages or profits resulting or which in the usual course would have resulted to him by reason of such breach. Provided that the contractor shall in no case be entitled to any compensation or damages on account of any delay in supply or non-supply thereof all or any such materials and stores provided further that the contractor shall be bound to execute the entire work if the materials are supplied by the Government within the original scheduled time for completion of the work plus 50% thereof or schedule time plus 6 months whichever is more if the time of completion of work exceeds 12 months, but if a part of the materials only has been supplied within the aforesaid period, then the contractor shall be bound to do so much of the work as may be possible with the materials and stores supplied in the aforesaid period. For the completion of the rest of the work, the contractor shall be entitled to such extension of time as may be determined by the Engineer-in-Charge whose decision in this regard shall be final and binding on the contractor.

The contractor shall see that only the required quantities of materials are got issued. Any such material remaining unused and in perfectly good/original condition at the time of completion or determination of the contract shall be returned to the Engineer-in-Charge at the stores from which it was issued or at a place directed by him by a notice in writing. The contractor shall not be entitled for loading, transporting, unloading and stacking of such unused material except for the extra lead, if any involved, beyond the original place of issue.

CLAUSE 10A: MATERIALS TO BE PROVIDED BY THE CONTRACTOR

The contractor shall, at his own expense, provide all materials, required for the works other than those which are stipulated to be supplied by the Government.

The contractor shall, at his own expense and without delay, supply to the Engineer-in-Charge samples of materials to be used on the work and shall get these approved in advance. All such materials to be provided by the Contractor shall be in conformity with the specifications laid down or referred to in the contract. The contractor shall, if requested by the Engineer-in-Charge furnish proof, to the satisfaction of the Engineer-in-Charge that the materials so comply. The Engineer-in-Charge shall within thirty days of supply of samples or within such further period as he may require intimate to the Contractor in writing whether samples are approved by him or not. If samples are not approved, the Contractor shall forthwith arrange to supply to the Engineer-in-Charge for his approval, fresh samples complying with the specifications laid down in the contract. When materials are required

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to be tested in accordance with specifications, approval of the Engineer-in-Charge shall be issued after the test results are received.

The Contractor shall at his risk and cost submit the samples of materials to be tested or analysed and shall not make use of or incorporate in the work any materials represented by the samples until the required tests or analysis have been made and materials finally accepted by the Engineer-in-Charge. The Contractor shall not be eligible for any claim or compensation either arising out of any delay in the work or due to any corrective measures required to be taken on account of and as a result of testing of materials.

The contractor shall, at his risk and cost, make all arrangements and shall provide all facilities as the Engineer-in-Charge may require for collecting, and preparing the required number of samples for such tests at such time and to such place or places as may be directed by the Engineer-in-Charge and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications. The Engineer-in-Charge or his authorised representative shall at all times have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the works and the contractor shall afford every facility and every assistance in obtaining the right to such access.

The Engineer-in-Charge shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default, the Engineer-in-Charge shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Engineer-in-Charge shall also have full powers to require other proper materials to be substituted thereof and in case of default, the Engineer-in-Charge may cause the same to be supplied and all costs which may attend such removal and substitution shall be borne by the Contractor.

The contractor shall at his own expense, provide a material testing lab at the site for conducting routine field tests. The lab shall be equipped atleast with the testing equipment as specified in Schedule “F”.

CLAUSE 10B: ADVANCES:

i) SECURED ADVANCE ON NON-PERISHABLE MATERIALS : The contractor, on signing an indenture in the form to be specified by the Engineer-in-Charge, shall be entitled to be paid during the progress of the execution of the work up to **90**% of the assessed value of any materials which are in the opinion of the Engineer-in-Charge non-perishable, non-fragile and non-combustible and are in accordance with the contract and which have been brought on the site in connection therewith and are adequately stored and/or protected against damage by weather or other causes but which have not at the time of advance been incorporated in the works. When materials on account of which an advance has been made under this sub-clause are incorporated in the work, the amount of such advance shall be recovered / deducted from the next payment made under any of the clause or clauses of this contract.

Such secured advance shall also be payable on other items of perishable nature, fragile and combustible with the approval of Engineer-in-Charge provided the contractor provides a comprehensive insurance cover for the full cost of such materials. The decision of the Engineer-in-Charge shall be final and binding on the contractor in this matter. No secured advance, shall however, be paid on high risk materials such as ordinary glass, sand, petrol, diesel etc.

ii) MOBILISATION ADVANCE: Mobilization advance **not exceeding 10% of the tendered value** may be given, if requested by the contractor in writing within one month of the order to commence the work. Such advance shall be in two or more installments to be determined by the Engineer-in-Charge at his sole discretion. The first installment of such advance shall be released by the Engineer-in-charge to the contractor on a request made by the contractor to the Engineer-in-Charge in this behalf. The second and subsequent installments shall be released by the Engineer-in- Charge only after the contractor furnishes a proof of the satisfactory utilisation of the earlier installment to the entire satisfaction of the Engineer-in-Charge.

Before any installment of advance is released, the contractor shall execute a Bank Guarantee Bond from Scheduled Bank for the amount of advance & valid for the contract period. This shall be kept renewed from time to time to cover the balance amount and likely period of complete recovery, together with interest.

Provided always that provision of Clause 10 B (ii) shall be applicable only when so provided in **'Schedule “F”**.

iii) PLANT, MACHINERY & SHUTTERING MATERIAL ADVANCE: An advance for plant, machinery & shuttering material required for the work and brought to site by the Contractor may be given if requested by the contractor in writing within one month of bringing such plant and machinery to site. Such advance shall be given on such plant and machinery, which in the opinion of the Engineer-in-Charge will add to the expeditious execution of work and improve the quality of work. The amount of advance shall be restricted to 5% percent of the tender value. In the case of new plant and equipment to be purchased for the work, the advance shall be restricted to 90% of the price of such new plant and equipment paid by the contractor for which the contractor shall produce evidence satisfactory to the Engineer-in-Charge. In the case of second hand and used plants and equipment, the amount of such advance shall be limited to 50% of the depreciated value of plant and equipment as may be decided by the Engineer-in-Charge. The contractor shall, if so required by the Engineer-in-Charge, submit the statement of value of such old plant and equipment duly approved by a Registered

Valuer recognised by the Central Board of Direct Taxes under the Income-Tax Act, 1961. No such advance shall be paid on any plant and equipment of perishable nature and on any plant and equipment of a value less than Rs. 50,000/-. 75% of such amount of advance shall be paid after the plant & equipment is brought to site and balance 25% on successfully commissioning the same.

Leasing of equipment shall be considered at par with purchase of equipment and shall be covered by tripartite agreement with the following:

1. Leasing company which gives certificate of agreeing to lease equipment to the contractor.
2. Engineer-in-;Charge and
3. The contractor.

This advance shall further be subject to the condition that such plant and equipment

(a) are considered by the Engineer-in-Charge to be necessary for the works; and

(b) are in working order and are maintained in working order;

c) hypothecated to the Government as specifiedi by the Engineer-in-Charge before the payment of advance is released.

The contractor shall not be permitted to remove from the site such hypothecated plant and equipment without the prior written permission of the Engineer-in-Charge. The contractor shall be responsible for maintaining such plant and equipment in good working order during the entire period of hypothecation failing which such advance shall be entirely recovered in lump sum. For this purpose, steel scaffolding and form work shall be treated as plant and equipment.

The contractor shall insure the Plant and Machinery for which mobilisation advance is sought and given, for a sum sufficient to provide for their replacement at site. Any amounts not recovered from the insurer will be borne by the contractor.

(iv) Interest & Recovery

The mobilization advance and plant and machinery advance in (ii) & (iii) above bear simple interest at the rate of 10% per annum and shall be calculated from the date of payment to the date of recovery, both days inclusive, on the outstanding amount of advance. Recovery of such sums advanced shall be made by the deduction from the contractors bills commencing after first 10% of the gross value of the work is executed and paid, on pro-rata percentage basis to the gross value of the work billed beyond 10% in such a way that the entire advance is recovered by the time 80% of the gross value of the contract is executed and paid, together with interest due on the entire outstanding amount upto the date of recovery of the installment.

(v) If the circumstances are considered reasonable by the Engineer-in-Charge, the period mentioned in (ii) and (iii) for request by the contractor in writing for grant of mobilization advance and plant and equipment advance may be extended in the discretion of the Engineer-in-Charge

CLAUSE 10C : PAYMENT ON ACCOUNT OF INCREASE IN PRICES / WAGES DUE TO STATUTORY ORDER(S) :

If after submission of the tender, the price of any material incorporated in the works (not being a material supplied from the Engineer-in-Charge's stores in accordance with clause 10 thereof) and/or wages of labour, increases as a direct result of the coming into force of any fresh law, or statutory rules or order (but not due to any changes in sales tax / VAT) and such increase in the price and / or wages prevailing at the time of the last date of receipt of the tenders for the work, and the contractor thereupon necessarily and properly pays in respect of that material (incorporated in the works) such increased price and / or in respect of labour engaged on the execution of the work such increased wages, then the amount of the contract shall accordingly be varied and provided further that any such increase shall not be payable, if such increase has become operative after the stipulated date of completion of the work in question.

If after submission of the tender, the price of any material incorporated in the works (not being a material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 thereof) and / or wages of labour is decreased as a direct result of the coming into force of any fresh law or statutory rules or order (but not due to any changes in sales tax / VAT) and such decrease in the prices and / or wages prevailing at the time of the last date of receipt of the tender for the work. Government shall in respect of materials incorporated in the works (not being materials supplied from the Engineer-in-Charge's stores in accordance with Clause 10 hereof) and / or labour engaged on the execution of the work after the date of coming into force of such law, statutory rule or order be entitled to deduct from the dues of the contractor, such amount as shall be equivalent to the difference between the prices of the materials and / or wages as prevailed at the time of the last date of receipt of tenders for the work and the prices of materials and / or wages of labour on the coming into force of such law, statutory rule or order.

The contractor shall for the purpose of this condition, keep such books of account and other documents as are necessary to show the amount of any increase claimed or reduction available and shall allow inspection of the same by a duly authorised representative of the Government, and further shall, at the request of the Engineer-in-Charge may require any documents so kept and such other information as the Engineer-in-Charge may require.

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The Contractor shall, within a reasonable time of his becoming aware of any alteration in the price of any such materials and / or wages of labour, give notice thereof to the Engineer-in-Charge stating that the same is given pursuant to this condition together with all information relating thereto which he may be in position to supply.

For this purpose, the labour component of the work executed during any period shall be the percentage as specified in Schedule F, of the value of work done during that period.

CLAUSE 10CA: Payment due to variation in prices of materials after receipt of tender:

If after submission of the tender, the price of materials specified in **Schedule "F"** increases / decreases beyond the price(s) prevailing at the time of the last date of receipt of tenders for the work, then the amount of the contract shall accordingly be varied and provided further that any such variations shall be effected for stipulated period of contract including the justified period extended under the provisions of Clause 5 of the Contract without any action under Clause 2.

However for work done during the justified period extended as above, it will be limited to indices prevailing at the time of stipulated date of completion or as prevailing for the period under consideration, whichever is less.

The increase / decrease in prices shall be determined by the All India Wholesale Price Indices of materials as published by Economic Adviser to ICTS-TIFR, Ministry of Commerce and Industry and base price for materials as issued under the authority of Project Engineer / tender approving authority as valid on the last date of receipt of tender and for the period under consideration. In case, price index of a particular material is not issued by Ministry of Commerce & Industry, then the price index of nearest similar material as indicated in **Schedule "F"** shall be followed.

The amount of the contract shall accordingly be varied for all such materials and will be worked out as per the formula given below for individual material:

Adjustment for component of individual material:

$$V = P \times Q \times \frac{Cl - Clo}{Clo}$$

Where,

V : Variation in material cost i.e increase or decrease in the amount in rupees to be paid or recovered.

P : Base price of material as issued under authority of Project Engineer / tender approving authority, valid at the time of last date of receipt of tender.

Q : Quantity of material used in the works since previous bill.

Clo : All India whole sale price index for the material as Published by the Economic Advisor to ICTS-TIFR, Ministry of Industry and Commerce as valid on the last date of receipt of tenders.

Cl : All India whole sale price Index for the material for period under consideration as published by Economic Advisor to ICTS-TIFR, Ministry of Industry and Commerce.

(In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the index prevailing at the time of stipulated date of completion or the prevailing index of the period under consideration, whichever is less, shall be considered.)

Provided always that provision of the preceding Clause 10C shall not be applicable in respect of materials covered in this clause.

CLAUSE 10 (CC) : PAYMENT DUE TO INCREASE / DECREASE IN PRICES / WAGES AFTER RECEIPT OF TENDER FOR WORKS:

If the prices of materials (not being materials supplied or services rendered at fixed prices by the Department in accordance with Clauses 10 & 34 thereof) and / or wages of labour required for execution of the work increase, the contractor shall be compensated for such increase as per provisions detailed below and the amount of the contract shall accordingly be varied, subject to the condition that such compensation for escalation in prices and wages shall be available only for the work done during the stipulated period of the contract including the justified period extended under the provisions of clause-5 of the contract without any action under Clause 2. However, for the work done during the justified period extended as above, the compensation as detailed below will be limited to prices / wages prevailing at the time of stipulated date of completion or as prevailing for the period under consideration, whichever is less. No such compensation shall be payable for a work for which the stipulated period of **completion is equal to or less than the time as specified in Schedule "F"**. Such compensation for escalation in the prices of materials and labour, when due, shall be worked out based on the following provisions:

(i). The base date for working out such escalation shall be the last date of receipt of tenders.

(ii). The cost of work on which escalation will be payable shall be reckoned as below:

a) Gross value of work done upto this quarter .....(A)
b) Gross value of work done upto the last quarter.....(B)
c) Gross value of work done since previous quarter (A-B) : .....(C)

d) Full assessed value of Secured Advance fresh paid in this quarter .....(D)
e) Full assessed value of Secured Advance recovered in this quarter: .....(E)
f) Full assessed value of Secured Advance for which escalation is .....(F)
payable in this quarter (D-E).

g) Advance payment made during this quarter .....(G)
h) Advance payment recovered during this quarter .....(H)
i) Advance payment for which escalation is payable in this quarter (G-H).....(I)

j) Extra items / Deviated quantities of items paid as per Clause 12 ……....(J)
based on prevailing market rates during this quarter

Then, M = C + F + I - J

N = 0.85 x M

k) Less cost of material supplied by the Department .....(K)
as per Clause 10 and recovered during the quarter.

l) Less cost of services rendered at fixed charges .....(L)
as per Clause 34 and recovered during the quarter.

Cost of work for which escalation is applicable
W = N - (K + L)

(iii). Components of Cement, Steel, Materials, Labour, P.O.L., etc. shall be pre-determined for every work and incorporated in the conditions of contract attached to the tender papers included in **Schedule "E".** The decision of the Engineer-in-Charge in working out such percentages shall be binding on the contractors.

(iv). The compensation for escalation for Cement, Steel, Materials, P.O.L. shall be worked as per the formulae given below :

a) Adjustment for component of "Cement"

$V_c = W \times (X_c / 100) \times \{(CI — CI_0) / CI_0\}$

V_c: Variation in cement cost i.e. increase or decrease in the amount in rupees to be paid or recovered.

W: Cost of work done, worked out as indicated in sub para (ii) of clause 10CC.

X_c: Component of cement expressed as percent of the total value of work.

CI: All India Whole Sale Price Index for Cement for the period under consideration as published by the Economic Adviser to ICTS-TIFR, Ministry of Industry and Commerce.

(In respect of the justified period extended under the provision of clause – 5 of the contract without any action under clause-2, the index prevailing at the time of stipulated date of completion or the prevailing index of the period under consideration, whichever is less, shall be considered).

CI_0: All India Whole Sale Price Index for Cement as published by the Economic Adviser to ICTS-TIFR, Ministry of Industry and Commerce as valid on the last date of receipt of tenders.

b) Adjustment for component of "Steel"

$V_S = W \times (X_S / 100) \times \{(SI — SI_0) / SI_0\}$

V_S: Variation in steel cost i.e. increase or decrease in the amount in rupees to be paid or recovered.

W: Cost of work done, worked out as indicated in sub para (ii) of clause 10CC.

X_S: Component of steel expressed in percent to the total value of work.

SI: All India Whole Sale Price Index for Steel (Bar & Rods) for the period under consideration as published by the Economic Adviser to ICTS-TIFR, Ministry of Industry and Commerce. However, the price index shall be minimum of the following :

i) Index for the month when the last consignment of steel reinforcement for the work is procured or

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ii) Index for the month in which half of the stipulated contract period is over.

iii) Index for the period under consideration.

For the justified period extended under the provision of clause – 5 of the contract, without any action under clause-2, the same principal as for the period within stipulated period of completion, will apply.

SI_0: All India Whole Sale Price Index for Steel (Bar & Rods) published by the Economic Adviser to ICTS-TIFR, Ministry of Industry & Commerce, as valid on the last date of receipt of tender.

c) Adjustment for Civil component (Except cement & steel) / Electrical component of construction Materials:

$V_M = W \times (X_M / 100) \times \{(MI — MI_0) / MI_0\}$

V_M: Variation in Materials cost i.e. increase or decrease in the amount in rupees to be paid or recovered.

W: Cost of work done, worked out as indicated in sub para (ii) of clause 10CC.

X_M: Component of Materials expressed as percent of the total value of work.

MI: All India Whole Sale Price Index for civil component / electrical component * of construction material as worked out on the basis of All India Whole Sale price Index for individual commodity / group items for the period under consideration as published by the Economic Adviser to ICTS-TIFR, Ministry of Industry and Commerce and applying weightages to the individual commodities / group items.

(In respect of the justified period extended under the provision of clause – 5 of the contract without any action under clause-2, the index prevailing at the time of stipulated date of completion or the prevailing index of the period under consideration, whichever is less, shall be considered).

MI_0: All India Whole Sale Price Index for Civil component / Electrical component * of construction material as worked out on the basis of All India Whole Sale price Index for individual Commodities / Group Items valid on the last date of receipt of tender, as published by the Economic Adviser to ICTS-TIFR, Ministry of Industry and Commerce and applying weightages to the individual commodities / Group items.

*** Note:** Relevant component only will be applicable

d) Adjustment for component of "POL"

$V_F = W \times (Z / 100) \times \{(FI — FI_0) / FI_0\}$

V_F: Variation in cost of Fuel, Oil and Lubricant i.e. increase or decrease in the amount in rupees to be paid or recovered.

W: Cost of work done, worked out as indicated in sub para (ii) of clause 10CC.

Z: Component of Fuel, Oil and Lubricant expressed as percent of the total value of work.

FI: All India Whole Sale Price Index for Fuel, Oil & Lubricant for the period under consideration as published by the Economic Adviser to ICTS-TIFR, Ministry of Industry & Commerce.

(In respect of the justified period extended under the provision of clause – 5 of the contract without any action under clause-2, the index prevailing at the time of stipulated date of completion or the prevailing index of the period under consideration, whichever is less, shall be considered).

FI_0: All India Whole Sale Price Index for Fuel, Oil and Lubricant valid on the last date of receipt of tender.

v) The following principles shall be followed while working out the indices mentioned in para (iv) above.

(a) The compensation for escalation shall be worked out at quarterly intervals and shall be with respect to the cost of work done as per bills paid during the three calendar months of the said quarter. The first such payment shall be made at the end of three months after the month (excluding) in which the tender was accepted and thereafter at three months interval. At the time of completion of the work, the last period for payment might become less than 3 months, depending on actual date of completion.

(b) The index (MI / FI etc.) relevant to any quarter / period for which such compensation is paid shall be the arithmetical average of the indices relevant to the three calendar months. If the period up to date of completion after the quarter covered by the last such installment of payment, is less than three months, the index MI & FI shall be the average of the indices for the months falling within that period.

vi) The compensation for escalation for labour shall be worked out as per the formula given below:

$VL = W \times (Y / 100) \times \{(LI — LI0) / LI0\}$

VL: Variation in labour cost i.e amount of increase or decrease in rupees to be paid or recovered.

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W: Value of work done, worked out as indicated in sub-para (ii) above.

Y: Component of labour expressed as a percent of the total value of the work

Ll: Minimum wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as applicable on the last date of the quarter previous to the one under consideration.

Ll0: Minimum daily wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as on the last date of receipt of tender.

(In respect of the justified period extended under the provision of clause – 5 of the contract without any action under clause-2, the minimum wage prevailing on the last date of quarter previous to the quarter pertaining to stipulated date of completion or the minimum wage prevailing on the last date of the quarter previous to the one under consideration, whichever is less, shall be considered.)

vii). The following principles will be followed while working out the compensation as per sub para (vi) above.

a)The minimum wage of an unskilled Male Mazdoor mentioned in sub para (vi) above shall be the higher of the wage notified by, Ministry of Labour and that notified by the local administration, both relevant to the place of work and the period of reckoning.

b) The escalation for labour also shall be paid at the same quarterly intervals when escalation due to increase in cost of materials and / or P.O.L. is paid under this clause. If such revision of minimum wages takes place during any such quarterly intervals, the escalation compensation shall be payable at revised rates only for work done in subsequent quarters.

c) Irrespective of variation in minimum wages of any category of labour, for the purpose of this clause, the variation in the rate for an unskilled adult Male Mazdoor alone shall form the basis for working out the escalation compensation payable on the labour component.

viii) In the event the price of materials and / or wages of labour required for execution of the work decrease(s), there shall be a downward adjustment of the cost of work so that such price of materials and / or wages of labour shall be deductable from the cost of work under this contract and in this regard the formula herein before stated under this clause 10 CC shall mutatis-mutandis apply, provided that:

(a) No such adjustment for the decrease in the price of materials and / or wages of labour aforementioned

(b) would be made in case of contracts in which the stipulated period of completion of the work is equal to or less than the time as specified in Schedule “F”.

(c) The Engineer-in-Charge shall otherwise be entitled to lay down the procedure by which the provision of this sub-clause shall be implemented from time to time and the decision of the Engineer-in-Charge in this behalf shall be final and binding on the contractor.

ix) Provided always that the provision of the preceding Clause 10 (C) and 10 CA shall not be applicable for contracts where provisions of this clause are applicable, but in cases where provisions of this clause are not applicable, the provisions of Clause 10 (C) and 10 CA will become applicable.

CLAUSE 10D : EXCAVATED / DISMANTLED MATERIAL WILL BE GOVT. PROPERTY:

The contractor shall treat all materials obtained during dismantling of a structure, excavation of the site for a work etc. as Governments property and such materials shall be disposed off to the best advantage of Government according to the instructions in writing issued by the Engineer-in-Charge.

CLAUSE 11 : WORK TO BE EXECUTED IN ACCORDANCE WITH SPECIFICATIONS, DRAWINGS, ORDERS, ETC. :

The contractor shall execute the whole and every part of the work in the most substantial and workman like manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the designs, drawings and instructions in writing in respect of the work signed by the Engineer-in-Charge and the contractor shall be furnished free of charge one copy of the contract documents together with specifications, designs, drawings and instructions as are not included in the Standard Specifications for Works of ICTS-TIFR and / or as specified in Schedule “F” or in any Bureau of Indian Standard or any other, published standard or code or any other printed publication referred to elsewhere in the contract.

The contractor shall comply with the provisions of the contract and with the care and diligence execute and maintain the works and provide all labour and materials, tools and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these, is specified or is reasonably inferred from the contract. The Contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction

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The contractor shall comply with the provisions of the contract and with the care and diligence execute and maintain the works and provide all labour and materials, tools and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these, is specified or is reasonably inferred from the contract. The Contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction.

CLAUSE 12 : DEVIATIONS / VARIATIONS : EXTENT AND PRICING:

The Engineer-in-Charge shall have power (i) to make alteration in, omissions from, additions to, or substitutions for the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work, and (ii) to omit a part of the works in case of non-availability of a portion of the site or for any other reasons and the contractor shall be bound to carry out the works in accordance with any instructions given to him in writing signed by the Engineer-in-Charge and such alterations, omissions, additions or substitutions shall form part of the contract as if originally provided therein and any altered, additional or substituted work which the contractor may be directed to do in the manner specified above as part of the works, shall be carried out by the contractor on the same conditions in all respects including price on which he agreed to do the main work except as hereafter provided.

12.1 The time for completion of the works shall, in the event of any deviations resulting in additional cost over the tendered value sum being ordered, be extended, if requested by the contractor, as follows:

i) In the proportion which the additional cost of the altered, additional or substituted work, bears to the original tendered value, plus

ii) 25% of the time calculated in (i) above or such further additional time as may be considered reasonable by the Engineer-in-Charge.

12.2: DEVIATION, EXTRA ITEMS AND PRICING: In the case of extra item(s) the contractor may within fifteen days of receipt of order or occurrence of the item(s), claim rates, supported by proper analysis, for the work and the engineer-in-charge shall within one month of the receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

In the case of substituted items, the rate for the agreement items (to be substituted) and substituted item shall also be determined in the manner as mentioned in the **following** para.

a) **DEVIATION, SUBSTITUTED ITEMS, PRICING:** If the market rate for the substituted item so determined is more than the market rate of the agreement item (to be substituted) the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so increased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

b) If the market rate for the substituted item so determined is less than the market rate of the agreement item (to be substituted) the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so decreased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

DEVIATION, DEVIATED QUANTITIES, PRICING: In the case of contract items, substituted items, contract cum substituted items, which exceed the limits laid down in **Schedule "F"**, the contractor may within **15 days** of receipt of order or occurrence of the excess, claim revision of the rates, supported by proper analysis, for the work in excess of the above mentioned limits, provided that if the rates so claimed are in excess of the rates specified in the schedule of quantities, the Engineer-in-Charge shall within one month of receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

12.3: The provisions of the preceding paragraph shall also apply to the decrease in the rates of items for the work in excess of the limits laid down in **Schedule "F"**, and the Engineer-in-Charge shall after giving notice to the contractor within one month of occurrence of the excess and after taking into consideration any reply received from him within **15 days** of the receipt of the notice, revise the rates for the work in question within one month of the expiry of the said period of **15 days** having regard to the market rates.

12.4 The contractor shall send to the Engineer-in-Charge once every **3 months** an upto date account giving complete details of all claims for additional payments to which the contractor may consider himself entitled and of all additional work ordered by the Engineer-in-Charge, which he has executed during the preceding quarter, failing which the contractor shall be deemed to have waived his right. However, the Engineer-in-Charge may authorise consideration of such claims on merits.

12.5: For the purpose of operation of **Schedule "F"**, the following works shall be treated as works relating to foundation.

i) For buildings, compound walls: plinth level or 1.2 metres (4 feet) above ground level, whichever is lower, excluding items of flooring and D.P.C. but including base concrete below the floors.

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ii) For abutments, piers, retaining walls of culverts and bridges, walls of water reservoirs: the bed of floor level.

iii) For retaining walls where floor level is not determinate: 1.2 metres above the average ground level or bed level.

iv) For roads: all items of excavations and filling including treatment of sub-base and soling work.

v) For water supply lines, sewer lines, under ground SWD & similar works: all items of work below ground level except items of piping work.

vi) For open storm water drains: all items of work except lining of drains.

12.6 Any operation incidental to or necessarily has to be in contemplation of tenderer while filing tender, or necessary for proper execution of the item included in the Schedule of quantities mentioned above, whether or not, specifically indicated in the description of the item and the relevant specifications, shall be deemed to be included in the rates quoted by the tenderer. Nothing extra shall be admissible for such operations.

CLAUSE 13: FORECLOSURE OF CONTRACT DUE TO ABANDONMENT OR REDUCTION IN SCOPE OF WORK:

If at any time after acceptance of the tender, Government shall decide to abandon or reduce the scope of the works for any reason whatsoever and hence not require the whole or any part of the works to be carried out, the Engineer-in-charge shall give notice in writing to that effect to the contractor and the contractor shall act accordingly in the matter. The contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the works in full but which he did not derive in consequence of the foreclosure of the whole or part of the works.

The contractor shall be paid at contract rates full amount for works executed at site and in addition, a reasonable amount as certified by the Engineer-in-charge for the items hereunder mentioned which could not be utilised on the work to the full extent in view of the foreclosure.

i) Any expenditure incurred on preliminary site work, e.g temporary access roads, temporary labour huts, staff quarters and site office, storage accommodation and water storage tanks.

ii) Government shall have the option to take over contractor's materials or any part thereof either brought to site or of which the contractor is legally bound to accept delivery from suppliers (for incorporation in or incidental to the work) provided however, Government shall be bound to take over the materials or such portions thereof as the contractor does not desire to retain. For materials taken over or to be taken over by Government, cost of such materials as detailed by Engineer-in-charge shall be paid. The cost shall, however, take into account purchase price, cost of transportation and deterioration or damage which may have been caused to materials whilst in the custody of the contractor.

iii) If any materials supplied by Government are rendered surplus, the same except normal wastage shall be returned by the contractor to Government at rates not exceeding those at which these were originally issued less allowance for any deterioration or damage which may have been caused whilst the materials were in the custody of the contractor. In addition, cost of transporting such materials from site to Government stores, if so required by Government, shall be paid.

iv) Reasonable compensation for transfer of T & P from site to contractor's permanent stores or to his other works, whichever is less. If T & P are not transported to either of the said places, no cost of transportation shall be payable.

v) Reasonable compensation for repatriation of contractor's site staff and imported labour to the extent necessary.

The contractor shall, if required by the Engineer-in-charge furnish to him books of account, wage books, time sheets and other relevant documents and evidence as may be necessary to enable him to certify the reasonable amount payable under this condition.

The reasonable amount of items on (i), (iv) and (v) above shall not be in excess of 2% of the cost of the work remaining incomplete on the date of closure, i.e. total stipulated cost of the work as per accepted tender less the cost of work actually executed under the contract and less the cost of contractor`s materials at site taken over by the Government as per item (ii) above `Provided always that against any payments due to the contractor on this account or otherwise, the Engineer-in-charge shall be entitled to recover or be credited with any outstanding balances due from the contractor for advance paid in respect of any tool, plants and materials and any other sums which at the date of termination were recoverable by the Government from the contractor under the terms of the contract.

CLAUSE 14 : CANCELLATION OF CONTRACT IN FULL OR PART : (Deleted & merged with clause– 3)

CLAUSE 15 : SUSPENSION OF WORK :

(i) The contractor shall, on receipt of the order in writing of the Engineer-in-Charge, (whose decision shall be final and binding on the contractor) suspend the progress of the works or any part thereof for such time and in such

manner as the Engineer-in-Charge may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of the following reasons:

(a) on account of any default on the part of the contractor or;

(b) for proper execution of the works or part thereof for reasons other than the default of the contractor; or

(c) for safety of the works or part thereof.

The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the Engineer-in-Charge.

(ii) If the suspension is ordered for reasons (b) and (c) in sub-para (i) above:

(a) the contractor shall be entitled to an extension of time equal to the period of every such suspension PLUS 25%, for completion of the item or group of items of work for which a separate period of completion is specified in the contract and of which the suspended work forms a part, and;

(b) If the total period of all such suspensions in respect of an item or group of items or work for which a separate period of completion is specified in the contract exceeds thirty days, the contractor shall, in addition, be entitled to such compensation as the Engineer-in-Charge may consider reasonable in respect of salaries and/or wages paid by the contractor to his employees and labour at site, remaining idle during the period of suspension, adding thereto 2% to cover indirect expenses of the contractor provided the contractor submits his claim supported by details to the Engineer-in-Charge within fifteen days of the expiry of the period of 30 days.

(iii) If the works or part thereof is suspended on the orders of the Engineer-in-Charge for more than three months at a time, except when suspension is ordered for reason (a) in sub-para (i) above, the contractor may after receipt of such order serve a written notice on the Engineer-in-Charge requiring permission within fifteen days from receipt by the Engineer-in-Charge of the said notice, to proceed with the work or part thereof in regard to which progress has been suspended and if such permission is not granted within that time, the contractor, if he intends to treat the suspension, where it affects only a part of the works as an omission of such part by Government or where it affects whole of the works, as an abandonment of the works by Government, shall within ten days of expiry of such period of 15 days give notice in writing of his intention to the Engineer-in-Charge. In the event of the contractor treating the suspension as an abandonment of the contract by Government, he shall have no claim to payment of any compensation on account of any profit or advantage which he might have derived from the execution of the work in full but which he could not derive in consequence of the abandonment. He shall, however, be entitled to such compensation, as the Engineer-in-Charge may consider reasonable, in respect of salaries and/or wages paid by him to his employees and labour at site, remaining idle in consequence adding to the total thereof 2% to cover indirect expenses of the contractor provided the contractor submits his claim supported by details to the Engineer-in-Charge within 30 days of the expiry of the period of 3 months.

Provided, further, that the contractor shall not be entitled to claim any compensation from Government for the loss suffered by him on account of delay by Government in the supply of materials in Schedule 'B' where such delay is covered by difficulties relating to the supply of wagons, force majeure including non-allotment of such materials by controlling authorities, acts of God, acts of enemies of the state/country or any reasonable cause beyond the control of the Government.

CLAUSE 16 : ACTION IN CASE OF WORK NOT DONE AS PER SPECIFICATIONS:

All works under or in course of execution or executed in pursuance of the contract, shall at all times be open and accessible to the inspection and supervision of the Engineer-in- charge, his authorised subordinates in charge of the work and all the superior officers of the Department or any organization engaged by the Department for Quality Assurance and of the Chief Technical Examiner's Office, and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing, present for that purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the contractor himself..

If it shall appear to the Engineer-in-charge or his authorised subordinates in-charge of the work or his subordinate officers or the officers of the organization engaged by the Department for Quality Assurance or to the Chief Technical Examiner or his subordinate officers, that any work has been executed with unsound, imperfect, or unskillful workmanship, or with materials or articles provided by him for the execution of the work which are unsound or of a quality inferior to that contracted or otherwise not in accordance with the contract, the contractor shall, on demand in writing which shall be made within twelve months (six months in the case of work costing Rs. 10 Lakh and below except road work) of the completion of the work from the Engineer-in-Charge specifying the work, materials or articles complained of notwithstanding that the same may have been passed, certified and paid for forthwith rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost. In the event of the failing to do so within a period specified by the Engineer-in-Charge in his demand aforesaid, then the contractor shall be liable to pay compensation at the same rate as under clause 2 of the contract (for non-completion of the work in time) for this default

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In such case the Engineer-in-Charge may not accept the item of work at the rates applicable under the contract but may accept such items at reduced rates as the authority specified in Schedule "F" may consider reasonable during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure or he may reject the work outright without any payment and/or get it and other connected and incidental items rectified, or removed and re-executed at the risk and cost of the contractor. Decision of the Engineer-in-Charge to be conveyed in writing in respect of the same will be final and binding on the contractor.

CLAUSE 17 : CONTRACTOR LIABLE FOR DAMAGES, DEFECTS DURING MAINTENANCE PERIOD :

If the contractor or his working people or servants shall break, deface, injure or destroy any part of building in which they may be working, or any building, road, road kerb, fence, enclosure, water pipe, cables, drains, electric or telephone post or wires, trees, grass or grassland, or cultivated ground contiguous to the premises on which the work or any part of it is being executed, or if any damage shall happen to the work while in progress, from any cause whatever or if any defect, shrinkage or other faults appear in the work within 12 months (6 months in the case of work costing Rs. 10,00,000/- and below except road work) after a certificate final or otherwise of its completion shall have been given by the Engineer-in-Charge as aforesaid arising out of defective or improper materials or workmanship, the contractor shall upon receipt of a notice in writing on that behalf make the same good at his own expense, or in default, the Engineer-in-Charge cause the same to be made good by other workmen and deduct the expense from any sums that may be due, or at any time thereafter may become due to the contractor, or from his security deposit, or the proceed of sale thereof or of a sufficient portion thereof. The security deposit of the contractor shall not be refunded before the expiry of 12 months (6 months in the case of work costing Rs. 10,00,000/- and below except road work) after the issue of the certificate final or otherwise, of completion of work, or till the final bill has been prepared and passed whichever is later. Provided that in the case of road work, if in the opinion of the Engineer-in-Charge, half of the security deposit is sufficient to meet all the liabilities of the contractor under this contract, half of the security deposit will be refundable after 6 months and the remaining half after 12 months of the issue of the said certificate of completion or till the final bill has been prepared and passed whichever is later. Performance Security shall be refunded to the contractor after completion of the work and recording the completion certificate.

In case of maintenance and operation of E&M services, the security deposit deducted from contractors shall be refunded within one month from the date of final payment or within one month from the date of completion of the maintenance contract, whichever is earlier

CLAUSE 18 : CONTRACTOR TO SUPPLY TOOLS & PLANTS ETC. :

The contractor shall provide at his own cost all materials (except such special materials, if any, as may in accordance with the contract be supplied from the Engineer-in-Charge's stores), machinery, tools & plants, as specified in Schedule "F". in addition to this, appliances, implements, other plants, ladders, cordage, tackle, scaffoldings and temporary works required for the proper execution of the work, whether original, altered or substituted and whether included in the specification or other documents forming part of the contract or referred to in these conditions or not, or which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer-in-Charge as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with carriage therefore to and from the work. The contractor shall also supply without charge the requisite number of persons with the means and materials, necessary for the purpose of setting out works, and counting, weighing and assisting in the measurement or examination at any time and from time to time of the work or materials. Failing his so doing, the same may be provided by the Engineer-in-Charge at the expense of the contractor and the expenses may be deducted, from any money due to the contractor, under the contract and/or from his security deposit or the proceeds of sale thereof, or of a sufficient portions thereof.

CLAUSE 18A : RECOVERY OF COMPENSATION PAID TO WORKMEN : In every case in which by virtue of the provisions of section 12 sub-section (1) of the Workmen's Compensation Act. 1923, Government is obliged to pay compensation to a workman employed by the contractor, in execution of the works, Government will recover from the contractor the amount of the compensation so paid; and, without prejudice to the rights of the Government under Section 12, sub-section (2) of the said Act, Government shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by Government to the contractor whether under this contract or otherwise. Government shall not be bound to contest any claim made against it under section 12, sub-section (1) of the said Act, except on the written request of the contractor and upon his giving to Government full security for all costs for which Government might become liable in consequence of contesting such claim.

CLAUSE 18B: ENSURING PAYMENT AND AMENITIES TO WORKERS IF CONTRACTOR FAILS:

In every case in which by virtue of the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and of the contract labour (Regulation and Abolition) Central Rules, 1971, Government is obliged to pay any amounts of wages to a workman employed by the contractor in execution of the works, or to incur any expenditure in providing welfare and health amenities required to be provided under the above said Act and the Rules, under Clause 19 H or under the Government of India Contractor's Labour Regulations, or under the rules framed by

Government from time to time for the protection of health and sanitary arrangements for workers employed by contractors, Government will recover from the contractor the amount of wages so paid or the amount of expenditure so incurred; and without prejudice to the rights of the Government under Section 20, sub-section (2) and Section 21, sub-section (4) of the contract labour (Regulation and Abolition) Act, 1970, Government shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by Government to the contractor whether under this agreement or otherwise. Government shall not be bound to contest any claim made against it under Section 20, sub-section (1) and section 21, sub-section (4) of the said Act, except on the written request of the contractor and upon his giving to the Government full security for all costs for which Government might become liable in contesting such claim.

CLAUSE 19 : LABOUR LAWS TO BE COMPLIED BY THE CONTRACTOR :

The contractor shall obtain a valid license under the Contract Labour (R & A) Act, 1970 and the Contract Labour (Regulation and Abolition) Central Rules, 1971, before the commencement of the work, and continue to have a valid license until the completion of the work. The contractor shall also abide by the provision of the Child Labour (Prohibition & Regulation) Act-1998.

The contractor shall also comply with the provisions of the building and other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996 and the building and other Construction Workers Welfare Cess Act, 1996.

Any failure to fulfill these requirements shall attract the penal provisions of this contract arising out of the resultant non-execution of the work.

CLAUSE 19A: NO LABOUR BELOW 18 YEARS : No labour below the age of **18 (eighteen)** years shall be employed on the work.

CLAUSE 19B : PAYMENT OF WAGES:

i) The contractor shall pay to labour employed by him either directly or through sub-contractors, wages not less than fair wages as defined in the ICTS-TIFR, Contractor's Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and the Contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.

ii) The contractor shall notwithstanding the provisions of any contract to the contrary, cause to be paid fair wage to labour indirectly engaged on the work, including any labour engaged by his sub-contractors in connection with the said work, as if the labour had been immediately employed by him.

iii) In respect of all labour directly or indirectly employed in the works for performance of the contractor's part of this agreement, the contractor shall comply with or cause to be complied with the ICTS-TIFR Contractor Labour Regulations made by Government from time to time in regard to payment of wages, wage period, deductions from wages, recovery of wages not paid and deductions unauthorisedly made, maintenance of wage books or wage slips, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and the Contract Labour (Regulation and Abolition) Central Rules 1971, wherever applicable.

iv-a) The Engineer-in-Charge concerned shall have the right to deduct from the moneys due to the contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reasons of non-fulfillment of the conditions of the contract for the benefit of the workers, non-payment of wages or of deduction made from his or their wages which are not justified by their terms of the contract or non-observance of the regulations.

iv-b) Under the provisions of the minimum wages act 1948 and the minimum wages (Central) Rules, 1950, the contractor is bound to allow or cause to be allowed to the labourers directly or indirectly employed in the works one day's rest for six days continuous work and pay wages at the same rate as for duty. In the event of default, the Engineer-in-Charge shall have the right to deduct the sum or sums not paid on account of wages for weekly holiday to any labourer, and pay the same to the persons entitled thereto from any money due to the contractor by the Engineer-in-Charge.

v) The contractor shall comply with the provisions of the payment of wages Act 1936, Minimum Wages Act, 1948, Employees Liability Act, 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefit Act, 1961 and the Contractor's Labour (Regulation and Abolition) Act, 1970 or the modifications thereof or any other laws relating thereto and the rules made there under from time to time.

vi) The contractor shall indemnify and keep indemnify Government against payments to be made under and for the observance of the laws aforesaid and the ICTS. Contractor's Labour Regulations without prejudice to his right to claim indemnity from his sub-contractors.

vii) The laws / regulations aforesaid shall be deemed to be a part of this contract and any breach thereof shall be deemed to be a breach of this contract.

viii) Whatever is the minimum wage for the time being, or if the wage payable is higher than such wage, such wage shall be paid by the contractor to the workmen directly without the intervention of Jamadar and that Jamadar shall not be entitled to deduct or recover any amount from the minimum wage payable to the workmen as and by way of commission or otherwise.

Ix) The contractor shall ensure that no amount by way of commission or otherwise is deducted or recovered by the Jamadar from the wage of workmen.

CLAUSE - 19C : SAFETY PROVISIONS FOR LABOUR & PENALTY ON DEFAULT : In respect of all labour directly or indirectly employed in the work for the performance of the contractor's part of this agreement, the contractor shall at his own expense arrange for the safety provisions as per ICTS-TIFR safety code framed from time to time and shall at his own expense provide for all facilities in connection therewith. In case the contractor fails to make arrangements and provide necessary facilities as aforesaid, he shall be liable to pay a penalty of **Rs. 200/-** for each default and in addition, the Engineer-in-Charge shall be at liberty to make arrangement and provide facilities as aforesaid and recover the costs incurred in that behalf from the contractor.

CLAUSE 19D : SUBMISSION OF LABOUR CHART BY EVERY FORTNIGHT : The contractor shall submit, by the 4th and 19th of every month, to the Engineer-in-Charge, a true statement showing, in respect of the second half of the preceding month and the first half of the current month respectively.

1. The number of labourers employed by him on the work.
2. Their working hours.
3. The wages paid to them.
4. The accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused by them, and
5. The number of female workers who have been allowed Maternity Benefit, according to clause 19 F and the amount paid to them.

Failing which the contractor shall be liable to pay to Government, a sum not exceeding Rs. 200/- for each default or materially incorrect statement. The decision of the Engineer-in-Charge shall be final in deducting from any bill due to the contractor, the amount levied as fine and be binding on the contractor.

CLAUSE 19E : HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS : In respect of all labour directly or indirectly employed in the works for the performance of the contractors part of this agreement, the contractor shall comply with or cause to be complied with all the rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by the ICTS. and its contractors.

CLAUSE 19F: MATERNITY BENEFIT RULES :

Leave and pay during leave shall be regulated as follows :

1) **LEAVE :**

i) **In the case of delivery :** maternity leave not exceeding 8 weeks, 4 weeks upto and including the day of delivery and 4 weeks following that day.

ii) **In the case of miscarriage :** upto 3 weeks from the date of miscarriage.

2) **PAY :**

i) **In the case of delivery :** leave pay during maternity leave will be at the rate of the women's average daily earnings, calculated on the total wages earned on the days when full time work was done during a period of 3 months immediately preceding the date on which she gives notice that she expects to be confined or at the rate of rupee one only a day whichever is greater.

ii) **In the case of miscarriage :** leave pay at the rate of average daily earning calculated on the total wages earned on the days when full time work was done during a period of 3 months immediately preceding the date of such miscarriage.

3) **CONDITIONS FOR THE GRANT OF MATERNITY LEAVE :**

No maternity leave benefit shall be admissible to a woman unless she has been employed for a total period of not less than 6 (six) months immediately preceding the date on which she proceeds on leave.

4) The contractor shall maintain a register of maternity (Benefit) in the prescribed from as given below, and the same shall be kept at the place of work.

CLAUSE 19G : PENALTY FOR NON COMPLIANCE OF LABOUR REGULATIONS : In the event of the contractor(s) committing a default or breach of any of the provisions of the ICTS. Contractor's Labour Regulations and Model Rules for the protection of health and sanitary arrangements for the workers as amended from time to time or furnishing any information or submitting or filing any statement under the provisions of the above Regulations and Rules which is materially incorrect, he/they shall, without prejudice to any other liability, pay to the Government a sum not exceeding Rs. 200/- for every default, breach or furnishing, making, submitting, filling such materially incorrect statements and in the event of the contractor(s) defaulting continuously in this respect, the penalty may be enhanced to Rs. 200/- per day for each day of default subject to a maximum of 5% of the

estimated cost of the work put to tender. The decision of the Engineer-in-Charge shall be final and binding on the parties.

Should it appear to the Engineer-in-Charge that the Contractor(s) is/are not properly observing and complying with the provisions of the ICTS. Contractors Labour Regulations and Model rules and the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and the contract Labour (R&A) Central Rules 1971 for the protection of health and sanitary arrangements for work people employed by the contractor(s) (hereinafter referred as "the said Rules") the Engineer-in-Charge shall have power to give notice in writing to the contractor(s) requiring that the said Rules be complied with and the amenities prescribed therein be provided to the work-people with in a reasonable time to be specified in the notice. If the contractor(s) shall fail within the period specified in the notice to comply with and/or observe the said Rules and to provide the amenities to the work-people as aforesaid, the Engineer-in-Charge shall have the power to provide the amenities here-in-before mentioned at the cost of the contractor(s).

The contractor(s) shall erect, make and maintain at his/their own expense and to approved standards all necessary huts and sanitary arrangements required for his/their work-people on the site in connection with the execution of the works, and if the same shall not have been erected or constructed, according to approved standards, the Engineer-in-Charge shall have power to give notice in writing to the contractor(s) requiring that the said huts and sanitary arrangements be remodeled and/or reconstructed according to approved standard, and if the contractor(s) shall fail to remodel or reconstruct such huts and sanitary arrangements according to approved standards within the period specified in the notice, the Engineer-in-Charge shall have the power to remodel or reconstruct such huts and sanitary arrangements according to approved standards at the cost of the contractor(s).

CLAUSE 19H: PROVIDING HUTMENTS, W/S, S/I, DRAINAGE, SANITATIONS ETC. FOR WORKERS: The contractor(s) shall at his/their own cost provide his/their labour with a sufficient number of huts (hereinafter referred to as the "camp") of the following specifications on a suitable plot of land to be approved by the Engineer-in-Charge.

1. a) The minimum height of each hut at the eaves level shall be 2.10 m (7'-0") and the floor area to be provided will be at the rate of 2.7 Sq.m. (30 sq.ft.) for each member of the worker's family staying with the labourer.

b) The contractor(s) shall in addition construct suitable cooking places having a minimum area of 1.80 m. x 1.50 m (6' x 5') adjacent to the hut for each family.

c) The contractor(s) shall also construct temporary latrines and urinals for the use of the labourers each on the scale of not less than four per each one hundred of the total strength, separate latrines and urinals being provided for women.

d) The contractor(s) shall construct sufficient number of bathing and washing places, one unit for every 25 persons residing in the camp. These bathing and washing places shall be suitably screened.

2. a) All the huts shall have walls of sun-dried or burnt-bricks laid in mud mortar or other suitable local materials as may be approved by the Engineer-in-Charge. In case of sun dried bricks, the walls should be plastered with mud gobri on both sides. The floor may be katcha but plastered with mud gobri and shall be at least 15 cm (6") above the surrounding ground. The roofs shall be laid with thatch or any other materials as may be approved by the Engineer-in-Charge and the contractor shall ensure that throughout the period of their occupation the roofs remain water-tight.

b) The contractor(s) shall provide each hut with proper ventilation.

c) All doors, windows and ventilators shall be provided with suitable leaves for security purposes.

d) There shall be kept an open space of at least 7.2 m (8 yards) between the rows of huts which may be reduced to 6 m (20') according to the availability of site with approval of the Engineer-in-Charge. Back to back construction will be allowed.

3. **Water Supply :** The contractor(s) shall provide adequate supply of water for the use of labourers. The provision shall not be less than 10 Ltrs. of pure and wholesome water per head per day for drinking purposes and 15 Ltrs. of clean water per head per day for bathing and washing purposes. Where piped water supply is available, supply shall be at stand posts and where the supply is from wells or rivers, tanks, which may be of metal or masonry, shall be provided. The contractor(s) shall also at his/their own cost makes arrangements for laying pipe lines for water supply to his/their labour camp from the existing mains wherever available, and shall pay all fees and charges therefore.

4. The site selected for the camp shall be high ground, removed from jungle.

5. **Disposal of Excreta :** The contractor(s) shall make necessary arrangements for the disposal of excreta from the latrines by trenching or incineration which shall be according to the requirements laid down by the Local Health Authorities. If trenching or incineration is not allowed, the contractor(s) shall make arrangements for the removal of the excreta through the Municipal Committee/authority and inform it about the number of labourers employed so that arrangements may be made by such committee/authority for the removal of the

excreta. All charges on this account shall be borne by the contractor and paid direct by him to the Municipality/authority. The contractor shall provide one sweeper for every 8 seats in case of dry system.

6. **Drainage :** The contractor(s) shall provide efficient arrangements for draining away sullage water so as to keep the camp neat and tidy.

7. **Lighting:** The contractor(s) shall make necessary arrangements for keeping the camp area sufficiently lighted to avoid accidents to the workers.

8. **Sanitation :** The contractor(s) shall make arrangements for conservancy and sanitation in the labour camps according to the rules of the Local Public Health and Medical Authorities.

CLAUSE 19I : REMOVAL OF INCOMPETENT WORKERS : The Engineer-in-Charge may require the contractor to dismiss or remove from the site of the work any person or persons in the contractors employ upon the work who may be incompetent or misconduct himself and the contractor shall forthwith comply with such requirements.

CLAUSE 19J : NO PART OF BUILDING TO BE OCCUPIED- ACTION ON BREACH THEREOF : It shall be the responsibility of the contractors to see that the building under construction is not occupied by anybody unauthorisedly during construction, and is hand over to the Engineer-in-Charge with vacant possession of complete building. If such building though completed, is occupied illegally, then the Engineer-in-Charge will have the option to refuse to accept the said building/buildings in that position. Any delay in acceptance on this account will be treated as delay in completion and for such delay levy upto 5% of tendered value of work may be imposed by the Project Engineer whose decision shall be final both with regard to the justification and quantum and be binding on the contractor.

However the Project Engineer, through a notice, may require the contractor to remove the illegal occupation any time on or before construction and delivery.

CLAUSE 19K : EMPLOYMENT OF SKILLED / SEMI SKILLED WORKERS

The contractor shall, at all stages of work, deploy skilled / semi skilled tradesmen who are qualified and possess certificate in particular trade from Industrial training institute / National Institute of Construction Management and Research (NICMAR)/ any similar reputed and recognized Institute managed / certified by State / Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled/semi skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen alongwith requisite certificate from recognized Institute to Engineer - in charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs.100/- per such tradesman per day. Decision of Engineer in Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.

Provided always, that the provisions of this clause, shall not be applicable for works with estimated cost put to tender being less than Rs.5 crores.

CLAUSE 20 : MINIMUM WAGES ACT TO BE COMPILED WITH :

The contractor shall comply with all the provisions of the Minimum Wages Act, 1948, Contract Labour (Regulation and Abolition) Act, 1970 and rules framed thereunder and other labour laws affecting contract labour that may be brought into force from time to time.

CLAUSE 21 : WORK NOT TO BE SUB-LET / ACTION IN CASE OF INSOLVENCY :

The contract shall not be assigned or sub-let without the written approval of the Engineer-in-Charge, and if the contractor shall assign or sub-let his contract, or attempt to do so, or become insolvent or commence any insolvency proceedings or make any composition with his creditors or attempt to do so, or if any bribe, gratuity, gift, loan, perquisite, reward or advantage pecuniary or otherwise, shall either directly or indirectly, be given, promised or offered by the contractor, or any of his servants or agent to any public officer or person in the employ of Government in any way relating to his office or employment, or if any such officer or person shall become in any way directly or indirectly interested in the contract, the Engineer-in-Charge on behalf of the DIRECTOR-ICTS shall have power to adopt any of the courses specified in Clause 3 hereof in the interest of Government and in the event of such course being adopted, the consequences specified in the said Clause 3 shall ensue.

CLAUSE 22 : SUMS PAYABLE BY WAY OF COMPENSATION :

All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of Government without reference to the actual loss or damage sustained, and whether or not any damage shall have been sustained.

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CLAUSE 23 : CHANGES IN FIRM'S CONSTITUTION TO BE INTIMATED :

Where the contractor is a partnership firm, the previous approval in writing of the Engineer-in-Charge shall be obtained before any change is made in the constitution of the firm. Where the contractor is an individual or a Hindu undivided family business concern, such approval as aforesaid shall likewise be obtained before the contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the works hereby undertaken by the contractor. If previous approval as aforesaid is not obtained, the contract shall be deemed to have been assigned in contravention of Clause 21 hereof and the same action may be taken, and the same consequences shall ensue as provided in the said Clause 21.

CLAUSE 24 : WORKS TO BE UNDER DIRECTION OF ENGINEER-IN-CHARGE :

All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Engineer-in-Charge who shall be entitled to direct at what point or points and in what manner they are to be commenced, and from time to time carried on.

CLAUSE 25 : SETTLEMENT OF DISPUTES & ARBITRATION:

Except where otherwise provided in the contract, all questions and disputes relating to the meaning of the specifications, designs, drawings and instructions here-in before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned here-in after.

i) If the contractor considers any work demanded of him to be outside the requirements of the contract, or disputes any drawings, record or decision given in writing by the Engineer-in-Charge on any matter in connection with or arising out of the contract or carrying out of the work, to be unacceptable, he shall promptly within 15 days request the **Engineer-in-Charge** in writing for written instruction or decision. Thereupon, the **Engineer-in-Charge** shall give his written instructions or decision within a period of one month from the receipt of the contractor's letter.

If the **Engineer-in-Charge** fails to give his instructions or decision in writing within the aforesaid period or if the contractor is dissatisfied with the instructions or decision of the **Engineer-in-Charge**, the contractor may, within 15 days of the receipt of **Engineer-in-Charge's** decision, appeal to the **Project Engineer,** who shall afford an opportunity to the contractor to be heard, if the latter so desires, and to offer evidence in support of his appeal. The **Project Engineer** shall give his decision within 30 days of receipt of contractor's appeal. If the contractor is dissatisfied with his decision, the contractor shall within a period of 30 days from receipt of the decision, give notice to the **Director / HOD** for appointment of arbitrator, failing which the said decision shall be final, binding and conclusive and not referable to adjudication by the arbitrator.

ii) Except where the decision has become final, binding and conclusive in terms of Sub Para (i) above disputes or difference shall be referred for adjudication through arbitration by a sole arbitrator appointed by the **Director / HOD** in respect of the contracts entered into by any sub-ordinate authority under him. However if the contract is entered into by the **Director / HOD**, the arbitrator shall be appointed by the **.** If the arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever, another sole arbitrator shall be appointed in the manner aforesaid. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor.

It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed in respect of each such dispute along-with the notice for appointment of arbitrator and giving reference to the rejection by the **Director / HOD** of the appeal.

It is also a term of this contract that no person other than a person appointed by such **Director / HOD**, as aforesaid should act as arbitrator and if for any reason that is not possible, the matter shall not be referred to arbitration at all.

It is also a term of this contract that if the contractor does not make any demand for appointment of arbitrator in respect of any claims in writing as aforesaid **within 120 days** of receiving the intimation from the Engineer-in-charge that the final bill is ready for payment, the claim of the contractor shall be deemed to have been waived and absolutely barred and the Government shall be discharged and released of all liabilities under the contract in respect of these claims.

The arbitration shall be conducted in accordance with the provisions of the Arbitration and Conciliation Act, 1996 (26 of 1996) or any statutory modifications or re-enactment thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceeding under this clause.

It is also a term of this contract that the arbitrator shall adjudicate on only such disputes as are referred to him by the appointing authority and give separate award against each dispute and claim referred to him and in all cases where the total amount of the claims by any party **exceeds Rs.1,00,000/-**, the arbitrator shall give reasons for the award.

It is also a term of the contract that if any fees are payable to the arbitrator, these shall be paid equally by both the parties.

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It is also a term of the contract that the arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties calling them to submit their statement of claims and counter statement of claims. The venue of the arbitration shall be such place as may be fixed by the arbitrator in his sole discretion. The fees, if any, of the arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of the parties. The cost of the reference and of the award (including the fees, if any, of the arbitrator) shall be in the discretion of the arbitrator who may direct to any by whom and in what manner, such costs or any part thereof shall be paid and fix or settle the amount of costs to be so paid.

CLAUSE 25A : NO ARBITRATION FOR DECISION ON SUB-STANDARD WORK : The decision of Project Engineer regarding the quantum or reduction as well as justification thereof in respect of rates for sub-standard work which may be decided to be accepted will be final and would not be open to arbitration.

CLAUSE 26 : CONTRACTOR TO INDEMNIFY GOVT. AGAINST PATENT RIGHTS:

The contractor shall fully indemnify and keep indemnified the DIRECTOR-ICTS against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claims made under or action brought against Government in respect of any such matters as aforesaid, the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expense, to settle any dispute or to conduct any litigation that may arise therefrom, provided that the contractor shall not be liable to indemnify the DIRECTOR-ICTS if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Engineer-in-Charge in this behalf.

CLAUSE 27: LUMP SUM PROVISION IN TENDER:

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

CLAUSE 28 : ACTION WHERE NO SPECIFICATIONS ARE SPECIFIED :

In the case of any class of work for which there is no such specification as referred to in clause 11, such work shall be carried out in accordance with the CPWD Specifications and Bureau of Indian Standard (BIS) Specifications. In case there are no such specifications in CPWD and / or BIS, the work shall be carried out as per manufacturer's specifications, if not available then as per District specifications. In case there are no such specifications as required above, the work shall be carried out in all respects in accordance with the instructions and requirements of the Engineer-in-Charge.

CLAUSE 29 : WITH HOLDING AND LIEN IN RESPECT OF SUMS DUE FROM CONTRACTOR :

i) Whenever any claim or claims for payment of a sum of money arises out of or under the contract or against the contractor, the Engineer-in-Charge of the Government shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security, if any deposited by the contractor and for the purpose aforesaid, the Engineer-in-Charge or the Government shall be entitled to withhold the security deposit, if any, furnished as the case may be and also have a lien over the same pending finalisation or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, the Engineer-in-Charge or the Government shall be entitled to withhold and have a lien to retain to the extent of such claimed amount or amounts referred to above, from any sum or sums found payable or which may at any time thereafter become payable to the contractor under the same contract or any other contract with the Engineer-in-Charge or the Government or any contracting person through the Engineer-in-Charge pending finalisation or adjudication of any such claim.

It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above, by the Engineer-in-Charge or Government will be kept withheld or retained as such by the Engineer-in-Charge or Government till the claim arising out of or under the contract is determined by the Arbitrator (if the contract is governed by the arbitration clause) by the competent court, as the case may be, and that the contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to above and duly notified as such to the contractor. For the purpose of this clause, where the contractor is a partnership firm or a limited company, the Engineer-in-Charge or the Government shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/limited company as the case may be, whether in his individual capacity or otherwise.

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ii) Government shall have the right to cause an audit and technical examination of the works and the final bills of the contractor including all supporting vouchers, abstract, etc., to be made after payment of the final bill and if as a result of such audit and technical examination any sum is found to have been overpaid in respect of any work done by the contractor under the contract or any work claimed to have been done by him under the contract and found not to have been executed, the contractor shall be liable to refund the amount of over-payment and it shall be lawful for Government to recover the same from him in the manner prescribed in sub-clause (i) of this clause or in any other manner legally permissible; and if it is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him under it, the amount of such under payment shall be duly paid by Government to the contractor; without any interest thereon whatsoever.

Provided that the Government shall not be entitled to recover any sum overpaid, nor the contractor shall be entitled to payment of any sum paid short where such payment has been agreed upon between the Engineer-in-Charge on the one hand and the contractor on the other under any term of the contract permitting payment for work after assessment by the Engineer-in-Charge.

CLAUSE 29A : LIEN IN RESPECT OF CLAIMS IN OTHER CONTRACTS : Any sum of money due and payable to contractor (including the security deposit returnable to him) under the contract may be withheld or retained by way of lien by the Engineer-in-Charge or the Government or any other contracting person or persons through Engineer-in-Charge against any claim of the Engineer-in-Charge or Government or such other person or persons in respect of payment of a sum of money arising out of or under any other contract made by the contractor with the Engineer in-charge or the Government or with such other person or persons.

It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the Engineer-in-Charge or the Government will be kept withheld or retained as such by the Engineer-in-Charge or the Government or till his claim arising out of the same contract or any other contract is either mutually settled or determined by the arbitration clause or by the competent court, as the case may be, and that the contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

CLAUSE 30 : EMPLOYMENT OF COAL MINING OR CONTROLLED AREA LABOUR NOT PERMISSIBLE:

The contractor shall not employ coal mining or controlled area labour falling under any category whatsoever on or in connection with the work or recruit labour from area within a radius of 32 Km. (20 miles) of the controlled area. Subject as above the contractor shall employ imported labour only i.e. deposit imported labour or labour imported by contractors from area, from which import is permitted.

Where ceiling price for imported labour has been fixed by State or Regional Labour Committees not more than that ceiling price shall be paid to the labour by the contractor.

The contractor shall immediately remove any labourer who may be pointed out by the Engineer-in-Charge as being a coal mining or controlled area labourer. Failure to do so shall render the contractor liable to pay to Government a sum calculated at the rate of Rs. 10/- per day per labourer. The certificate of the Engineer-in-Charge about the number of coal mining or controlled area labourer and the number of days for which they worked shall be final and binding upon all parties to this contract.

It is declared and agreed between the parties that the aforesaid stipulation in this clause is one in which the public are interested within the meaning of the exemption of Section 74 of Indian Contract Act, 1872.

Explanation — "Controlled Area" means the following areas:

Districts of Dhanbad, Hazaribagh, Jamtara – a Sub-Division under of Santhal Paragana Commissionery. Districts of Bankuara, Birbhum, Burdwan District of Bilaspur.

Any other area which may be declared as Controlled area by or with the approval of the Central Government.

CLAUSE 31 : UNFILTERED WATER SUPPLY:

The contractor(s) shall make his/their own arrangements for water required for the work and nothing extra will be paid for the same. This will be subject to the following conditions:

i) that the water used by the contractor(s) shall be fit for construction purposes, to the satisfaction of the Engineer-in-Charge.

ii) The Engineer-in-Charge shall make alternative arrangements for supply of water at the risk and cost of the contractor (s) if the arrangement made by the contractor (s) for procurement of water or in the opinion of the Engineer-in-Charge, unsatisfactory.

CLAUSE 31-A : DEPARTMENTAL WATER SUPPLY IF AVAILABLE:

Water if available may be supplied to the contractor by the Department subject to the following conditions:

i) The water charges @ 1% shall be recovered on gross amount of the work done.

ii) The contractor (s) shall make his / their own arrangement of water connection and laying of pipe line from existing main of source of supply.

iii) The Department do not guarantee to maintain uninterrupted supply of water and it will be incumbent on contractor (s) to make alternative arrangement for water at his / their own cost in the event of any temporary break-down in the Government water main so that the progress of his / their work is not held-up for want of water. No claim of damage or refund of water charges will be entertained on account of such break-down.

CLAUSE 32 : ALTERNATE WATER ARRANGEMENT :

i) Where there is no piped water supply arrangement and the water is taken by the contractor from the wells or hand pumps constructed by the Government, no charge shall be recovered from the contractor on that account. The contractor shall, however, draw water at such hours of the day that it does not interfere with the normal use for which the hand pumps and wells are intended. He will also be responsible for all damages and abnormal repair arising out of his use, the cost of which shall be recoverable from him. The Engineer-in-Charge shall be the final authority to determine the cost recoverable from the contractor on this account and his decision shall be binding on the contractor.

ii) The contractor shall be allowed to construct temporary wells in Government land for taking water for construction purposes only after he has got permission of the Engineer-in-Charge in writing. No charges shall be recovered from the contractor on this account, but the contractor shall be required to provide necessary safety arrangements to avoid any accidents or damage to adjacent buildings, roads and service lines. He shall be responsible for any accidents or damage caused due to construction and subsequent maintenance of the wells and shall restore the ground to its original condition after the wells are dismantled on completion of the work

CLAUSE 33 : RETURN OF SURPLUS MATERIALS :

Notwithstanding anything contained to the contrary in this contract, where any materials for the execution of the contract are procured with the assistance of Government either by issue from Government stocks or purchase made under orders or permits or licenses issued by Government, the contractor shall hold the said materials economically and solely for the purpose of the contract and not dispose of them without the written permission of the Government and return, if required by the Engineer-in-Charge, all surplus or unserviceable materials that may be left with him after the completion of the contract or at its termination for any reason whatsoever on being paid or credited such price as the Engineer-in-Charge shall determine having due regard to the condition of the materials. The price allowed to the contractor however shall not exceed the amount charged to him excluding the element of storage charges. The decision of the Engineer-in-Charge shall be final and conclusive. In the event of breach of the aforesaid condition, the contractor shall in addition to throwing himself open to action for contravention of the terms of the license or permit and/or for criminal breach of trust, be liable to Government for all moneys, advantages or profits resulting or which in the usual course would have resulted to him by reason of such breach.

CLAUSE 34 : Hire of plant and machinery : DELETED.

CLAUSE 35 : Use of asphaltic materials : DELETED

CLAUSE 36 : EMPLOYMENT OF TECHNICAL STAFF AND EMPLOYEES:

Contractors Superintendence, Supervision, Technical Staff & Employees

(i) The contractor shall provide all necessary superintendence during execution of the work and all along thereafter as may be necessary for proper fulfilling of the obligations under the contract.

The contractor shall immediately after receiving letter of acceptance of the tender and before commencement of the work, intimate in writing to the Engineer-in-Charge, the name(s), qualifications, experience, age, address(s) and other particulars along with certificates, of the principal technical representative to be in charge of the work and other technical representative (s) who will be supervising the work. Minimum requirement of such technical representative (s) and their qualifications and experience shall not be lower than specified in Schedule “F”. The Engineer-in-Charge shall within 3 days of receipt of such communication intimate in writing his approval or otherwise of such a representative (s) to the contractor. Any such approval may at any time be withdrawn and in case of such withdrawal, the contractor shall appoint another such representative (s) according to the provisions of this clause. Decision of the tender accepting authority shall be final and binding on the contractor in this respect. Such a principal technical representative and other technical representative (s) shall be appointed by the contractor soon after receipt of the approval from Engineer-in-charge and shall be available at site before start of work.

All the provisions applicable to the principal technical representative under the clause will also be applicable to other technical representative(s). The principal technical representative and other technical representative (s) shall be present at the site of work for supervision at all times when any construction activity is in progress and also present himself / themselves, as required, to the Engineer-in-Charge and/or his designated representative to

take instructions. Instructions given to the principal technical representative or other technical representative (s) shall be deemed to have the same force as if these have been given to the contractor. The principal technical representative and other technical representative (s) shall be actually available at site fully during all stages of execution of work, during recording / checking / test checking of measurements of works and whenever so required by the Engineer-in-Charge and shall also note down instructions conveyed by the Engineer-in-Charge or his designated representative(s) in the site order book and shall affix his / their signature in token of noting down the instructions and in token of acceptance of measurements / checked measurements / test checked measurements. The representative(s) shall not look after any other work. Substitutes, duly approved by Engineer-in-Charge of the work in similar manner as aforesaid shall be provided in event of absence of any of the representative (s) by more than two days.

If the Engineer-in-Charge, whose decision in this respect is final and binding on the contractor, is convinced that no such technical representative(s) is / are effectively appointed or is / are effectively attending or fulfilling the provision of this clause, a recovery (non-refundable) shall be effected from the contractor as specified in Schedule "F" and the decision of the Engineer-in-Charge as recorded in the site order book and measurement recorded checked / test checked in Measurement Books shall be final and binding on the contractor. Further if the contractor fails to appoint suitable technical / Principal technical representative and / or other technical representative(s) and if such appointed persons are not effectively present or are absent by more than two days without duly approved substitute or do not discharge their responsibilities satisfactorily, the Engineer-in-Charge shall have full powers to suspend the execution of the work until such date as suitable other technical representative(s) is / are appointed and the contractor shall be held responsible for the delay so caused to the work. The contractor shall submit a certificate of employment of the technical representative(s) alongwith every on account bill / final bill and shall produce evidence if at any time so required by the Engineer-in-Charge.

(ii) The contractor shall provide and employ on the site only such technical assistants as are skilled and experienced in their respective fields and such foremen and supervisory staff as are competent to give proper supervision to the work.

The contractor shall provide and employ skilled, semiskilled and unskilled labour as is necessary for proper and timely execution of the work.

The Engineer-in-Charge shall be at liberty to object to and require the contractor to remove from the works any person who in his opinion misconducts himself or is incompetent or negligent in the performance of his duties or whose employment is otherwise considered by the Engineer-in-Charge to be undesirable. Such person shall not be employed again at works site without the written permission of the Engineer-in-Charge and the persons so removed shall be replaced as soon as possible by competent Substitute.

CLAUSE 37 : LEVY / TAXES PAYABLE BY CONTRACTOR:

(i) Sales Tax / VAT or any other tax on materials in respect of this contract shall be payable by the contractor and Government shall not entertain any claim whatsoever in this respect.

(ii) The contractor shall deposit royalty and obtain necessary permit as required for supply of the sand, aggregate, stone etc. from local authorities.

(iii) If pursuant to or under any law, notification or order any royalty, cess or the like becomes payable by the ICTS-TIFR and does not any time become payable by the contractor to the State Government. Local authorities in respect of any material used by the contractor in the works then in such a case, it shall be lawful to the ICTS-TIFR and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from dues of the contractor

CLAUSE 38: CONDITIONS FOR REIMBURSEMENT OF LEVY / TAXES IF LEVIED AFTER RECEIPT OF TENDERS:

i) All tendered rates shall be inclusive of all taxes and levies payable under respective statutes. However, pursuant to the Constitution (46th Amendment) Act 1982, if any further tax or levy is imposed by Statute, after the last date of the receipt of tender and the contractor thereupon necessarily and properly pays such taxes / levies, the contractor shall be reimbursed the amount so paid, provided such payments, if any, is not, in the opinion of the Engineer-in-Charge (whose decision shall be final and binding on the contractor) attributable to delay in execution of work within the control of the contractor.

ii) The contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorised representative of the Government and / or the Engineer-in-charge and further shall furnish such other information / document as the Engineer-in-charge may require from time to time.

iii) The contractor shall, within a period of 30 days of the imposition of any such further tax or levy, pursuant to the Constitution (46th Amendment) Act 1982, give a written notice thereof to the Engineer-in-charge that the same is given pursuant to this condition, together with all necessary information relating thereto.

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CLAUSE 39 : TERMINATION OF CONTRACT IN CASE OF DEATH :

Without prejudice to any of the rights or remedies under this contract, if the contractor dies, the Engineer-in-Charge on behalf of the DIRECTOR-ICTS shall have the option of terminating the contract without compensation to the contractor.

CLAUSE 40 : IF RELATIVE WORKING IN ICTS-TIFR, THEN THE CONTRACTOR NOT ALLOWED TO TENDER :

The contractor shall not be permitted to tender for works in the ICTS-TIFR (responsible for award and execution of contracts) in which his near relative is posted as AAO / AO or as an officer in any capacity in the grade SO"C" & above. He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Gazetted Officer in the ICTS-TIFR. Any breach of this condition by the contractor would render him liable to be barred to tender in the ICTS-TIFR.

NOTE : By the term **'near relative'** is meant wife, husband, parents and grand parents, children and grand children, brothers and sisters, uncles, aunts and cousins and their corresponding in-laws.

CLAUSE 41 : NO OFFICER ALLOWED TO WORK AS A CONTRACTOR WITHIN ONE YEAR OF RETIREMENT :

No officer employed in engineering or administrative duties in an engineering department of the ICTS-TIFR shall work as a contractor or employee of a contractor **for a period of one year after his retirement** from government service without the previous permission of ICTS-TIFR in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of ICTS-TIFR as aforesaid, before submission of the tender or engagement in the contractor's service, as the case may be.

CLAUSE 42 : RETURN OF MATERIALS AND RECOVERY FOR EXCESS MATERIAL ISSUED :

(i) After completion of the work and also at any intermediate stage in the event of non-reconciliation of materials issued, consumed and in balance - (see Clause 10), theoretical quantity of materials issued by the Government for use in the work shall be calculated on the basis and method given hereunder

(a) Quantity of cement shall be calculated on the basis of quantity of cement required for different items of work as per the statement in the Specifications / approved designs of mixes for concrete and / or on the basis of standard approved by the Department. In case any item is executed for which standard constants for the consumption of cement are not available in the above mentioned Specification, CPWD Standard Norms shall be followed, or the same shall be calculated on the basis of standard formula to be laid down by the Project Engineer / HOD. Permissible variation shall be as specified in the Schedule "F".

(b) The provisions of the foregoing sub-clause shall apply Mutatis-Mutandis in the case of steel reinforcement or structural steel sections, except that the theoretical quantity of steel shall be taken as the quantity required as per design or as authorised by the Engineer-in-Charge, including authorised variation (lappages), plus wastage due to cutting into pieces. Permissible variation / wastage shall be as specified in the Schedule "F".

(c) Theoretical quantity of G.I. & C.I. or other pipes, conduits, wires and cables, pig lead and G.I./M.S. sheets shall be taken as quantity actually required and measured plus 5% for wastage due to cutting into pieces (except in the case of G.I./M.S. sheets it shall be 10%), such determination & comparison being made diameter-wise & category-wise.

(d) For any other material as per actual requirements.

(ii) Over the theoretical quantities of materials so computed a variation shall be allowed as specified in Schedule 'F'. The difference in the net quantities of material actually issued to the contractor and the theoretical quantities including such authorised variation, if not returned by the contractor or if not fully reconciled to the satisfaction of the Engineer-in-Charge within fifteen days of the issue of written notice by the Engineer-in-charge to this effect shall be recovered at the rates specified in Schedule 'F', without prejudice to the provision of the relevant conditions regarding return of materials governing the contract. Decision of Engineer-in-Charge in regard to theoretical quantities of materials, which should have been actually used and recovery at rates specified in Schedule 'F', shall be final & binding on the contractor.

For non scheduled items, the decision of the Engineer-in-Charge regarding theoretical quantities of materials which should have been actually used, shall be final and binding on the contractor.

iii) The said action under this clause is without prejudice to the right of the Government to take action against the contractor under any other conditions of contract for not doing the work according to the prescribed specifications.

CLAUSE 43 : COMPENSATION DURING WAR-LIKE SITUATIONS :

The work (whether fully constructed or not) and all materials, machines, tools and plants, scaffolding, temporary buildings and other things connected therewith shall be at the risk of the contractor until the work has been delivered to the Engineer-in-Charge and a certificate from him to that effect obtained. In the event of the

work or any materials properly brought to the site for incorporation in the work being damaged or destroyed in consequence of hostilities or war like operations, the contractor shall, when ordered in writing by the Engineer-in-Charge, remove any debris from the site, collect and properly stack or remove in store all serviceable materials salvaged from the damaged work and shall be paid at the contract rates in accordance with the provision of this agreement for the work of clearing the site of debris, stacking or removal of serviceable materials and for reconstruction of all works ordered by the Engineer-in-Charge, such payments being in addition to compensation up to the value of the work, originally executed before being damaged or destroyed and not paid for. In case of works damaged or destroyed but not already measured and paid for, the compensation shall be assessed by the Engineer-in-Charge up to Rs.5,000/- and by the Project Engineer for a higher amount. The contractor shall be paid for the damage/destruction suffered and for the restoring the materials at the rate based on the analysis of rates tendered for in accordance with the provisions of the contract. The certificate of the Engineer-in-Charge regarding the quality and quantity of materials and the purpose for which they were collected shall be final and binding on all parties to this contract.

Provided always that no compensation shall be payable for any loss in consequence of hostilities or war-like operations (a) unless the contractor had taken all such precautions against Air Raid as are deemed necessary by the A.R.P. Officers or the Engineer-in-Charge, (b) for any materials etc. not on the site of the work or for any tools and plant, machinery, scaffolding, temporary buildings and other things not intended for the work.

In the event of the contractor having to carry out reconstruction as aforesaid, he shall be allowed such extension of time for its completion as is considered reasonable by the Engineer-in-Charge.

CLAUSE 44 : APPRENTICES ACT - PROVISIONS TO BE COMPLIED WITH :

The contractor shall comply with the provisions of the Apprentices Act, 1961 and the rules and orders issued thereunder from time to time. If he fails to do so, his failure will be a breach of the contract and the Project Engineer may, in his discretion, cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.

Signature of the Contractor **Signature of the Project Engineer**

SEAL

Seal and Signature of Tenderer

SECTION-5(ii) : SPECIAL CLAUSES OF CONTRACT

1. GENERAL :

The following Special clauses of contract shall be read in conjunction with General clauses of contract. The same shall be considered as an extension and not limitation of the obligations of the contractor. In case of any discrepancy between Special clauses of contract and the General clauses of contract, these Special clauses shall take precedence over the General clauses of the Contract.

2. SCOPE AND LOCATION OF WORK : ***(Pl. refer to Schedule "A")***

The contractor carrying this work will be strictly abide by the Local / Municipal / Statutory body / Police / Department's regulations as well as security regulations imposed by such authorities from time to time regarding transshipments of equipment, operations, drainage, late hour working, working on holidays, bringing / taking away of materials, disposal of debries, excavated / surplus materials etc. as and wherever applicable.

The contractor for this work shall co-ordinate his work with other contractors who will be simultaneously carrying out the work in the same area. All workmen working at heights beyond 1st floor shall be provided with safety belts and the workers should be directed to wear safety belts as long as they are working. The instructions issued by the Engineer-in-Charge with regard to safety and security of workmen from time to time to be strictly followed. All other safety measures stipulated in the tender documents shall be strictly followed, failing which the Engineer-in-Charge shall take immediate action deemed fit and the same shall be binding on the contractor.

The work shall be completed as per detailed time-schedule, which shall be prepared after issue of work order. However the entire work shall be completed within the stipulated completion period as specified in the Tender Notice.

3. SITE INVESTIGATIONS :

The tenderers are advised to visit the site of work with prior permission of the Project Engineer / Engineer-in-Charge or his authorised representative, to acquaint themselves as to the nature and location of the work, access to the site, the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials, availability of labour, water, electric power and road, as also uncertainties of weather or similar physical conditions of the site, the formation and conditions of the ground, the character, quality and quantity of surface and sub-surface materials to be encountered, including subsoil water levels, the character of equipment and facilities needed preliminary to and during the progress of the work, and all other matters which can be, in any way, effect the work or the cost thereof under the contract.

4. STAKING OUT BASE LINES AND LEVELS :

The contractor shall establish at site the lay out of the building/road etc. for the work from base lines and grids established by the Department and shall be responsible for all measurements in connection therewith. The contractor shall, at his own expenses, furnish all stakes, templates, platform, equipments, ranges and labour that may be required in setting out or laying out any part of the work. The contractor shall be held responsible for the proper execution of the work to such lines, levels and grids as may be established or indicated on the drawings and specifications. The contractor shall check the bench marks and stakes existing at the site for laying out lines and levels.

The contractor has to construct and maintain proper bench marks at all salient positions in order that the lines and levels may be accurately checked at all times.

Theodolite, levels, prismatic compass, chain, steel and metallic tapes and all other surveying instruments found necessary on the works shall be provided by the contractors for use at site in connection with this work.

5. COMMENCEMENT AND COMPLETION OF WORK AND PROPER SCHEDULE :

The work shall be completed within the stipulated period of completion. The contractor shall submit detailed time schedule in triplicate within 15 days from the date of issue of work order, for completion of the work, indicating all the important activities of execution of the work / group of the items in sequence of its operation etc. including making ready the sample finishes / finished sample flat for bldg. works, in consultation with the Engineer-in-Charge, and submit the same for approval of the work awarding authority. This time schedule, after approval, shall form part of the contract and the work in all respects shall be carried out as per this time schedule.

Time shall be the essence of the contract. The rate of progress of the whole work as well as for all the important individual items of work shall not be slower than as laid down in the attached Time schedule.

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The contractor shall properly assess his capability and fully satisfy himself before tendering that he will be able to adhere to the specified schedule. In this connection the attention of the tenderer is specially invited to clause 2 of the General Conditions of the Contract.

The contractor shall furnish to the Engineer-in-Charge monthly progress report in triplicate on 5th day of every month indicating the following :

Sl. No.	Item of work	Scheduled progress for the month	Actual short-fall if any	Reasons for short-fall	Steps taken to make-up the short-fall

5(a) The contractor shall employ sufficient number of skilled and unskilled labour required for the work for maintaining the progress of work as stipulated in the Time schedule. The trade-wise labour strength should be intimated to the Engineer-in-Charge everyday in writing. The skilled labour shall be increased if required by Engineer-in-Charge to maintain progress of the work.

6. SEQUENCE OF WORK : The contractor shall execute the work as per the sequence given by the Engineer-in-Charge from time to time so that all other items of the work to be executed by other agencies are completed progressively along with the main work.

7. CO-OPERATION WITH OTHER CONTRACTORS : The contractor shall extend all facilities and give complete co-operation for the execution of various connected works, if required to be carried out simultaneously **by other agencies,** while his own work is in progress. The co-ordination will be effected in consultation with the Engineer-in-Charge of the work. Other contractors are also likely to be authorised by the Department to work in the same area during the construction stage of the work.

Since Electrical/Air-conditioning/other agencies will have to carry out their works such as installations of conduits, junction boxes, wiring, distribution boxes, switches, fittings and fixtures etc. in a planned manner in stages which will be in relation to the status and progress of civil construction works, the civil contractor shall accept and take over the inventories of installations of Electrical/Air-conditioning/other agencies when their works are in part/full completion stage. The same inventory in the same condition will have to be handed over back to the electrical/air-conditioning/other agencies for carrying out their remaining works after the stage-wise completion of the civil works. During final handing over of the building(s) to the Department/Users, the civil contractor will again take over the installation/inventories of fittings and fixtures of electrical/air-conditioning/other agencies and will complete all his balance finishing works and hand over his works along with the installations of other agencies to the Department / Users.

The contractor shall afford all facilities :

a) For the installation of embedded parts, sleeves with its accessories in slabs, beams and walls by the other agencies before the reinforcement is placed, necessary cut-outs in the shuttering will have to be provided by the civil contractor for this purpose for which no extra payment will be admissible.

b) For the installation of various service lines in the walls, floors, slabs, ducts etc.

c) For using approach road etc. by the other contractors.

No extra claims on account of facilities provided for carrying out the work mentioned above will be entertained.

8. CO-ORDINATION : The contractor will carry out the entire work in a planned manner by co-ordinating his work with other contractors, who will be simultaneously carrying out work in the same area and also co-ordinate in connection with the position of various fixtures, inserts, embedments and other allied work connected with the completion of the building / subject work.

In case of any dispute between the contractors engaged on the same work, decision of Engineer-in-Charge shall be final and binding.

9. APPROACH ROADS AND TRANSPORTATION OF EQUIPMENT & MATERIALS : Contractor will be permitted to use the existing roads in the establishment area for the purpose of transporting equipment and materials and for use of labour etc. The Engineer-in-Charge, however, will not undertake to provide any approach roads to the actual site of work. It shall be the entire responsibility of the contractor to provide and maintain such temporary approach roads including cross drainage works if any at his own cost for the purpose of movement of men, materials and equipment. Layout of such approach roads shall be submitted to Engineer-in-Charge for his approval before undertaking the construction of the same. Such approach roads shall be made available to other agencies for carrying out the work in the same area in consultation with the Engineer-in-Charge of the works without any cost.

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10. OPERATIONS AND STORAGE AREAS : All operations of the contractor shall be confined to areas authorised by the Engineer-in-Charge and storage of materials shall be over the areas specially indicated by the Engineer-in-Charge. Materials like sand and metal of different sizes shall be stored in properly constructed bins with hard floor to avoid inter mixing as well as mixing with objectionable materials. The contractor shall be obliged to keep the premises in hygienic conditions by proper drainages of the area provided with suitable approaches throughout the period of contract. He shall rectify all damages caused to the Government property within the areas thus allotted. He shall be responsible to clear all rank, vegetation at site at his own cost.

11. CONTRACTOR'S STORAGE AND SITE OFFICE : Suitable area near the site of work shall be allocated to the contractor, @ Re.1/- per month as token compensation, for storing his equipment, plant, materials etc. and for his site office and cement godown. He will, however, be solely responsible for watching or guarding his property and materials issued to him by the Department. Contractor shall cover all materials at site with requisite insurance against theft, larceny, dacoits, fire tempest and flood. He, however, will have to dismantle the shed and vacate the land after the receipt of due notice from the Engineer-in-Charge if the same is obstructing any work.

The tenderer should obtain necessary permission / approval from Statutory authorities such as Municipal corporations / Local bodies etc. for construction of temporary structures at site of work such as cement godown, stores, site office etc. It will be responsibility of the tenderers to prepare proper plans, to pay any requisite fees to statutory authorities and to execute the work for the temporary structure at their own cost as per the conditions and rules laid by statutory authorities.

12. TEMPORARY BUILDINGS : Warehouse, shed, workshop and office facilities as required by the contractor shall be provided by him at his own expense. Area for the same will be made available by the Department @ Re.1/- per month as token compensation. Prior approval of the Engineer-in-Charge shall be obtained in respect of location and layout and details of those buildings. After the work is over, all these temporary facilities shall be removed by the contractor at his own expense to the satisfaction of the Engineer-in-Charge within 10 days from the date of completion.

No labour shall be permitted to stay at site or in the partly completed building at any time and no land for erection of temporary huts for labourers will be made available by the Department. The contractor shall make his own arrangements for labour hutments elsewhere out side the Department's colony/area at his own cost. Unauthorised occupation of any area/partly completed building by the contractor's labourer will be treated as trespass and action will be taken to evict them including termination of contract if deemed fit. Sanitary as well as water supply and drainage facilities as required by the labour laws in force, are to be provided by the contractor at his own cost.

13. TRAFFIC INTERFERENCE & INCONVENIENCE TO THE PUBLIC : The contractor shall so conduct his operations as to interfere as little as possible with the traffic/public. When interference to traffic is inevitable, a notice of such interference shall be given to the Engineer-in-Charge well in advance (at least 2 days) at any stage, if it becomes necessary to divert the traffic, the contractor shall obtain permission from the local traffic authorities at his own expense. The Department will render reasonable assistance in the matter. The contractor shall take all precautionary and other measure, such as providing warning signals, temporary diversion etc. all as directed by the Engineer-in-Charge.

The contractor shall not deposit materials anywhere at work site which will seriously inconvenience the public. The Engineer-in-Charge may require the contractor to remove any materials which are considered to be a danger or inconvenience to the public or cause them to be removed at the contractor's cost.

The contractor shall exercise full care to ensure that no damage is caused by him or his workmen, during the operation to the existing water supply and power lines. The cost of any such damage and risks arising out of this shall be entirely borne by the contractor.

14. DRAINAGE AROUND THE BUILDINGS AND FOUNDATION FOR OTHER WORKS : The contractor shall be entirely responsible for the provision and maintenance of efficient drainage arrangements in the work site to lead of all water whatsoever pumped from the excavations on account of rains, floods, springs or any other source whatsoever. The foundation trenches shall be kept free from water while all the works below ground level are in progress.

Flooding or ponding of water in the work site shall not be permitted under any circumstances whatsoever and the contractor shall take all necessary precautions to prevent the same by providing suitable pumps and other dewatering arrangement.

The cost of repairing damages if any, to the work under execution or to any government property in and around the site shall be entirely borne by the contractor where such damages are due to his non-compliance with the above conditions.

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15. SPECIFICATIONS AND DRAWINGS :

15.1 The drawings furnished to the contractor for this work shall be interpreted by the use of given dimensions and nomenclature only and the drawings shall not be scaled. Drawings to a large scale shall have precedence over those to a smaller scale. Prior to the execution of the work, the contractor shall check all drawings, specifications and shall immediately report any error, discrepancy and / or omissions discovered therein to the Engineer-in-Charge and obtain appropriate orders on the same. Any adjustment made by the contractor without prior approval of the Engineer-in-Charge shall be at his own risk. Description of item in the schedule of quantities is brief and therefore, shall be read in conjunction with the relevant drawings and the specifications and the contractor's rate shall be deemed to be for such complete work unless otherwise specified by the contractor while tendering.

15.2 In case any difference or discrepancy between the description in the schedule of quantities and the specifications, the schedule of quantities shall take precedence.

In case any difference or discrepancy between the description in the schedule of quantities and the drawing, the description in schedule of quantities shall take precedence. In case of any difference or discrepancy between drawing and specifications, the specifications shall take precedence.

15.3 Prior to submission of drawing called for as per specifications or any other drawings, contractor may intend to submit for approval, the contractor shall be responsible for thoroughly checking of all drawings to ensure that they comply with the intend and the requirements of the contract specifications and that they fit in with the over all lay out. Drawing found to be inaccurate or otherwise in error will be returned to the contractor for corrections.

15.4 For all drawings to be submitted by the contractor, for the approval of the Engineer-in-Charge, the contractor shall submit 6 (six) copies of each drawing.

15.5. The approval of the drawings by the Engineer-in-Charge shall not be construed as a complete dimensional check, but will indicate only that the general method of construction as detailed is satisfactory. The contractor shall be responsible for the dimensions and designs of adequate connection supports, details and satisfactory construction of the work.

15.6. Cost of all shop drawings, fabrication drawings or form work drawings and details to be furnished by the contractor shall be deemed to be included in his tendered rates. Approval of shop drawings shall not be construed as authorised additional work of increased costs to the Department.

16. SAMPLES FOR MATERIALS: Samples of all materials to be incorporated in the work shall be submitted to the Engineer-in-Charge for his approval without any extra cost. The approved samples will be kept with Engineer-in-Charge till completion of the work. Materials not conforming strictly to the approved samples will be rejected. Samples of various materials required for testing shall be provided free of charge by the contractor. Testing charges if any, including all other expenses required to be incurred for taking the samples, conveyance, packing etc., shall be borne by the contractor.

16.1 In addition to submission of samples of materials, the contractor shall make a sample flat (sample finishing works in case of Non-Redl. bldgs.) ready in all respects, including the finishing items of works of civil works including installation of fittings as well as those of water supply, plumbing and sanitation work and electrical, internal fittings, fixtures and wiring etc. to determine the acceptable standard of materials and workmanship. The sample flat with all final finishes and installations etc. shall be got approved from the Engineer-in-Charge in advance before taking up the finishing items of the work in the building(s). Each of these samples of items of work / trade / materials approved by the Engineer-in-Charge will be endorsed as "Guide line samples", as per which further works shall be executed in strict conformity with standard of materials & workmanship.

The provision of co-ordination and co-operation with other agencies shall be mutatis-mutandis applicable to the above mentioned "Sample flat / Sample finishing works" also.

17. EXECUTION OF WORK AND INSPECTION : The work shall be conducted under the general direction of the Engineer-in-Charge and is subject to inspection by his appointed representative to ensure strict compliance with the terms of the contract. No failure of the Engineer-in-Charge or his designated representative during the progress of the work to discover or to reject materials, or work not in accordance with the requirement of this contract shall be deemed as on acceptance thereof or a waiver of defects therein and no payment by the Engineer-in-Charge or partial or entire occupancy of the premises shall be construed to be an acceptance of work or materials which are not strictly in accordance with the requirements of the contract. No changes whatsoever to any provision of specifications shall be made without authorisation from the Engineer-in-Charge.

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18. SUPPLY OF WATER FOR CONSTRUCTION PURPOSE:

Note: *In the case of non-stipulation of departmental water supply as per* ***Schedule 'B' of Salient Governing features of the Tender / work",*** *the contractor shall make his own arrangement of water required for the work, at his own cost, subject to the approval of the Engineer-in-Charge.*

The contractor shall arrange to provide a minimum storage of 5000 Ltrs. (or two days requirement whichever is higher) of water at building location and all necessary pumps for storage of water shall be built by the contractor at his own cost at location to be approved by the Engineer-in-Charge. The water storage tanks should be leak proof and wastage and misuse of water is strictly prohibited. Contamination and pollution of water to be strictly avoided. Construction water should not be used for drinking or for domestic purpose. Contractor will make his own arrangement for water required for drinking purposes at site of work at his own cost.

19. SUPPLY OF ELECTRICITY FOR CONSTRUCTION PURPOSE :

In case of stipulation of departmental supply of Electricity for construction purpose under ***Schedule 'B' of Salient Governing features of the Tender / work",*** *the same* shall be dealt with as under:

(In case of non-stipulation of departmental supply of Electricity for construction purpose in the **Schedule "B",** the contractor shall make his own arrangement for the same as required at his own cost.)

19.1 General: Temporary electric power, if required by the contractor shall be provided for bonafide construction purposes required for the site job but limited to a total max. of **5 KW** (connected) at 3 phase, 400 volts, 50 cps. Some of the important conditions governing the power supply shall be as follows:

a) The power will be supplied (on receipt of application in prescribed form) **at one point within 50 M.** of the building premises. The contractor shall install his own main switch, cables, electric cupboard / switch room etc. of adequate capacity and of suitable type to receive, control and further distribute the power involved. The exact location and further details about the supply point will on receipt of the contractor's application be decided upon by the Department, whose decision in the matter will be final and binding. The total final connected load and the anticipated maximum demand shall be furnished by the contractor about a month in advance of the actual initial requirement and for any addition in load subsequent to the initial supply, atleast one week's notice from the date of submission of installation test report for the said addl. load will be given.

b) The contractor shall provide his own switches, cable / lines of approved make and of adequate capacity from the aforesaid supply point to the various utilization points and also be responsible to maintain the same in good and safe condition at all times as per relevant codes and electricity rules. He will also be fully responsible at all times for any accident / mishap in his electrical installation / appliances etc. (including the consequential aspects) if the same are found to be due to defective construction / maintenance etc. of his installation or negligence in observation of rules, or safety precautions. The lay out and other details of these lines shall be got approved in advance by the Department and no change in the same shall be subsequently carried out without Department's prior approval. The Department's electrical Engineer may any time summarily disconnect, in the interest of safety, the power supply without notice, if any dangerous situation is seen in the contractor's installation or if the contractor has failed to maintain the installation satisfactorily inspite of a written notice served on him. The responsibility for such a disconnection will always be with the contractor who will have no claim whatsoever in this respect on the Department.

c) The contractor's electrical installation shall conform in all respects to the relevant rules, regulations, statutory provisions and codes of practice as also be in accordance with the rules of the local licenses State Electricity Boards / Undertakings / Corporations / Agencies (as the case may be) as existing new or as may be amended / enforced from time to time in the future. Installation test reports shall invariably be furnished by the contractor before any load is connected. Periodical test reports by every 3 months for the complete installation shall also be submitted by the contractor in accordance with I.E.E. Rules for temporary installation.

d) Power will be supplied at the point mentioned in para (a) above at the usual 400 V, 3 Phase, 50 cycles, 4 wire or single phase 230 V, 2-wire system as the case may be subject to permissible variations in voltage and frequency. In case of 3 phase supply the individual single phase loads if any, shall be suitably connected so that the total load over three phases at the supply point is balanced as much as possible. No individual single phase equipment or a single phase system shall normally exceed a rating of 2 K.W.

e) The Department will install, in the covered space provided by the contractor at the aforesaid supply point necessary energy meter for registering the electricity (i.e. KWH) supplied. Rental charges for poly phase / single phase meter shall be as specified in the **Schedule "B".** It may be necessary to install separate departmental meter for lighting consumption and in that case the contractor shall have to provide separate lighting circuits.

f) The supply of electricity shall be billed at the rate specified in the **Schedule "B",** or at the rates fixed by the respective state electricity boards from time to time. In addition nominal service charges at the rate specified in the **Schedule "B"** shall also be charged. The contractor shall be responsible for the safety of the Department's meter, cut outs etc. installed at his site.

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NOTE : The electricity will normally be billed once every month at the prevailing supply rate from time to time. In case of any increase in supply rate, the same shall be charged with an addition of Departmental charges as per **Schedule "B".**

g) The power supply shall be subject to all such restrictions, regulations etc., as in existence and as may be enforced from time to time in future by the licenses / Government / Department or by any other competent authority, for which the contractor will have no claim whatsoever. Although all efforts shall be made to provide a continuous supply, the contractor shall have no claim whatsoever due to any breakdown or interruption etc. in the supply at any time.

19.2 CONSTRUCTION AND MAINTENANCE BY THE CONTRACTOR :

As mentioned above, the contractor shall maintain his entire electrical installation, appliances etc. in good and safe condition as required under relevant rules and codes of practice. However, the following precautions and directives shall be followed in addition to observing other essential rules :

i) The minimum clearance (measured at the lowest sag point) to be maintained for all over head lines shall be 4 Mtrs. cross country or along roads and 6.1 metres across roads.

ii) Metallic poles as a general rule should be avoided and if used should be earthed individually.

iii) All loose hanging of wires and cables should be avoided. The line wires should be properly supported and an approved method of fixing shall be adopted.

iv) Installation shall not cause any hindrance to the normal movement of men and materials at site.

v) All cables and wires should be adequately protected against mechanical damage during construction activity of all contractors, working at site.

vi) In case the cable is required to be laid in ground, it should be adequately protected by covering the same with bricks, R.C.C. tiles or any other approved means and cable markers provided at suitable intervals as per approval of the Department.

vii) Laying of cable and wires direct on floor shall not be allowed but if absolutely necessary for some very short lengths, the same shall be taken through suitable mechanical covering like G.I. / M.S. Pipes etc.

viii) All the cut door switch boards, equipments etc., should be adequately protected against rain or preferably they should not be exposed to weather.

ix) If overhead lines using bare conductors are installed, a guard wire system of adequate size shall run along the cables / wires and earthed effectively.

x) The connection for portable machines shall be taken only through suitably rated 3 pin socket points. Iron clad industrial type outlets are preferred. While taking supply through socket outlet a plug top must be used, avoiding inserting of loose wires in the sockets. The third pin of the plug shall invariably be earthed and 3 core wire of appropriate specifications and capacity shall be used.

xi) All three phase equipment shall be provided with duplicate earthing. All metallic frames, light fixtures, portable equipments etc. should be effectively earthed to main earthing.

xii) Duly authorised persons having valid wireman's license / competence certificate must be employed under the supervision of a qualified and experienced Electrical Supervisor for carrying out electrical work and repair of electrical equipments, installation and maintenance etc. at site.

19.3 Additional Power:

Power in excess of the limit stipulated above may, subject to availability, be provided if applied for by the contractor by installing additional cables / lines from the change over nearby. These additional lines along with necessary switches etc. shall be provided by the Department and full cost thereof will be payable by the contractor in advance.

20. TENDERED RATES :

The rates quoted by the tenderer in the schedule shall be inclusive of all taxes including Sales tax, VAT, Purchase tax, duties and other statutory levies / taxes etc. imposed by the Government or other public bodies from time to time. The rates quoted shall also cover the cost of necessary protection including labour, materials and equipment to ensure safety and protection against risk or accident, compensation for injury to life and damage to property if any, caused by the contractor's operations connected with this work. The rates shall be firm and shall not be subject to change due to variations during the entire period of execution of the work in cost of materials, labour and conditions, or any other conditions whatsoever except for the provisions contained in clause 10 C, 10 CA and 10 CC of General conditions of contract as applicable for this work.

The rates quoted by the tenderer shall also be inclusive of State Sales Tax on the transfer of property in goods involved in execution of works contract Act, 1985 (in other words WCT / Turn over Tax) which is to be paid by the tenderer to the government from time to time during the execution of the contract / works. No separate claim on this account will be entertained by the Department. Also no certificate(s) for exemption of Octroi / Entry tax shall be issued by the Department.

Unless otherwise stated in schedule of quantities, rates for item quoted by the tenderer should be for the complete work including supply and fixing with all materials and should be for all heights and depths, lifts and leads, lengths and widths involved in the work.

Any cement slurry added over base surface (or) for continuation of concreting, for better bond, is added to have been in-built in the item (unless otherwise explicitly stated) and nothing extra shall be payable and no extra cement considered in consumption on this account.

Rate for all items, in which use of cement is involved, shall include charges for curing.

The contractor when called for by the Department should furnish detailed rate analysis in support of the rates quoted by him against each item of the tender. The Department reserves the right to utilize the analysis thus supplied in settling the rate of any deviations or claims arising in this contract.

For any deviations or claims or extra items arising out of this contract, the contractor will be entitled for overheads and profits of 2.5% (two and half percent) only towards handling, storing etc. of such materials which are supplied by the Department under **Schedule 'B'** and / or at fixed issue rates / procurement rates in case of free issue materials.

21. CLAIMS AGAINST THE CONTRACTOR :

Whenever any claim against the contractor for the payment of a sum or money arises out of or under the contract, Department shall be entitled to recover such sum by appropriating in part or whole, the security deposit of the contractor and to sell any Government promissory notes etc. forming the whole or part of such security. In the event of the security deposit having been taken from the contractor, the balance or the total sum recoverable, as the case may be, shall be deducted from any sum then due or which at any time thereafter may become due from the contractor, under this or any other contract with the Department. Should this sum be not sufficient to cover the full amount recoverable, the contractor shall pay the Department, on demand the balance remaining due. Department shall have the right to cause an audit and technical examination of the work and the final bill of the contractor including all supporting vouchers, abstracts etc. to be made after payment of the final bill and if as a result of the due audit and technical examination any sum is found to have been over paid in respect of any work done by the contractor under the contract or any work claimed by him to have been done under the contract and found not have been executed, the contractor shall be liable to refund the amount of the over payment and it shall be lawful for the Department to recover the same from him in the manner prescribed above or in any other manner legally permissible and if it is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him under it, amount of such under payment shall be duly paid by the Department to the contractor.

Provided that the Department shall not be entitled to recover any sum overpaid, nor the contractor shall be entitled to payment of any such paid short where such payment has been agreed upon between the Engineer-in-Charge on one hand and the contractor on the other, under any term of the contract permitting payment for work after assessment by the Engineer-in-Charge.

Provided further no recovery of an over payment and no payment of any sum paid short shall be made where such over payment or under payment has remained undiscovered for a period of three years after the date of payment of the final bill.

22. MODE OF MEASUREMENTS :

Measurements for all hidden items once taken jointly and so accepted by the tenderer in the bills, in writing shall be final and binding. No re-recording of measurements for hidden items of work will be permitted.

The contractor shall provide at his own cost suitable weighing and measuring arrangements at site for checking the weight / dimensions as may be necessary for execution of the work. All measuring tapes (of steel), scaffolding and ladders which may be required for taking measurements shall be supplied by the contractor.

If the contractor fails to accompany the Engineer-in-Charge or his duly authorised person to take measurements, then he shall be bound by the measurements, recorded by the Engineer-in-Charge or his representative.

23. STORES AND MATERIALS AT SITE :

Stores and materials required for the works are to be deposited by the contractor only in places to be indicated by the Engineer-in-Charge. The Engineer-in-Charge shall have a right at any time to inspect and examine any stores and materials intended to be used in or on the works either on the site or at any factory or workshops or other places where such stores or materials are being constructed or manufactured or processed or any place from where they are being obtained and the contractor shall give such facilities as required to be given for such inspection and examination.

The Engineer-in-Charge shall be entitled to have tests made without any extra cost to the Department at an approved laboratory for any stores and or materials supplied by the Contractor, who shall provide at his own expense all the facilities which the Engineer-in-Charge may require for this purpose.

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Any stores and materials brought to site for use on the work shall not be removed off the site without prior written approval of the Engineer-in-Charge, but on final completion of the work, the contractor shall at his own expenses remove from the site all surplus stores and materials originally brought by him.

24. PROPER DRAWINGS AND INSTRUCTIONS : The Engineer-in-Charge shall have full powers and authority to supply to the contractor from time to time during progress of the work such further drawings and instructions as shall be necessary for the purpose of proper and adequate execution and maintenance of the work and the contractor shall carry out the work and be bound by the same.

One copy each of the drawings furnished to the contractor shall be kept by the contractor at the site and the same shall at all reasonable times be made available for inspection and use by the Engineer-in-Charge and any other person authorised by the Engineer-in-Charge.

25. EMPLOYMENT OF STAFF FOR PLUMBING & ELECTRICAL WORKS;

25.1 Employment of certified plumber : Certified plumbers should be employed by the contractor on the work for main sewer, filtered and unfiltered main.

25.2 Employment of licensed electrical foreman : The contractor should employ a licensed electrical foreman to supervise the Electrical works.

26. GOVERNMENT LABOUR ACT : The contractor has to follow strictly the Government labour Acts, which are and will be in force during the period of execution of work. All necessary arrangement for labourer's safety, insurance will have to be made by the contractor as per Municipal rules / ICTS-TIFR contractor's labour regulations / Other Central or Local statutory body. The contractor shall insure his labourers with Janata Insurance Policy and all risk insurance policies etc. at his own cost.

27. DEDUCTION OF INCOME TAX : As per Section 194-C of Income tax Act 1961, as amended by letter No. 275/9/72/9-TJ (Circular No. 86) dated 19.5.72 and No. 275/14/91-IT (B) (Circular No. 593) dated 5.2.91, received from Ministry of Finance, Department of Revenue, Central Board of Direct Taxes, New Delhi, the Income tax @ 2% and Surcharge thereon @12% (or any other amended rate by Ministry of Finance from time to time), of the gross value of the work done will be recovered from the bills. A certificate for the amount so recovered will be issued by the Department.

28. URGENT REPAIRS : If by reason of any accident or failure or other event occurring to or in connection with the work or any part thereof either during the period of maintenance, any remedial or other work or repair shall in the opinion of the Engineer-in-Charge be urgently necessary for security and the contractor is unable or unwilling, at once, to do such work or repair, the Engineer-in-Charge may be his own or other workmen do such work or repair as he may consider necessary. If the work or repair so done which in the opinion of the Engineer-in-Charge, the contractor was liable to do at his own expenses under the contract and all cost and charges properly incurred by the Engineer-in-Charge in so doing shall on demand be paid by the contractor or may be deducted from any sum due or which may become due to the contractor provided always that the Engineer-in-Charge shall soon after the occurrence of any such emergency as may be reasonable, practicable, notify the contractor thereof in writing.

29. SECURITY REGULATIONS : The contractors have to follow strictly the regulations of the Department at the work site regarding entry of personnel, material etc. and any other regulation that might be enforced from time to time. All materials and articles brought by the contractor to the work site shall have to be declared at the security gate. Similarly no materials shall be taken out from the Departmental premises without proper gate pass, which will be issued by the Engineer-in-Charge to the contractor on written request. It is to be noted that loading of contractor's materials in vehicles and trucks shall be done in the presence of Departmental personnel. The contractor's representative will have to escort the materials till the security check is over.

The contractors, suppliers, vendors, workers engaged in work/business will be issued with renewable entry permit to avoid unauthorised entry in the Departmental area/site on scrutiny of applications in prescribed form.

For working on Sundays, Holidays and late hours, even though permission will be accorded by the Engineer-in-Charge, the contractor will have to make application to the Security Department also and keep them informed well in advance.

The area where the proposed work is to be carried is residential / non-residential area under the control of Security authorities of Department, entry to the site of work shall be through the main gate only. The contractors shall follow strictly the security regulations of the Department at site of work regarding entry of personnel, materials etc. and other regulations that might be enforced from time to time at the work site and also in the campus for smooth and efficient operation. The contractor, his agents, representatives, workmen etc. and his materials, carts, trucks or other means of transport etc. will be allowed to enter through and leave from such point of entry/exit at such times, the authorities in-charge of the area, at their sole discretion, may permit.

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The contractor, his agents and representatives are required to be in possession of the individual identity / muster cards or passes. The muster cards or passes are examined by the security staff at the time entry / exit inside the departmental area and also at any time or number of times within such area.

The contractor will have to apply for entry/muster permits of likely number of labour to be engaged during the week for the workers and authorise their representatives to collect the entry permits for labour from the Departmental Security Authorities.

It will be the responsibility of the contractor to maintain the list of labourers permitted to work inside the premises in a register and the representative of contractor's labour will have to issue entry pass to each labour after making necessary entry in the registers.

The contractor, his agents, representatives, workmen shall strictly observe the orders pertaining to prevailing fire precautions.

In addition to the above, other security regulations as may be imposed by the Security authorities / Engineer-in-Charge shall be complied with / observed by the contractor and his workmen, in addition to the above.

Any breach of above security regulations and rules in force from time to time will be viewed seriously. No claim whatsoever will be entertained by the Department on account of the observation of the Security regulations.

30. WATCH AND WARD AND LIGHTING : The contractor shall in connection with the works provide and maintain at his own cost all lights, guards, fencing and watching when and where necessary or as required by the Engineer-in-Charge and duly constituted authority for the protection of the workers or for safety and convenience of the public or others. The contractor shall be responsible for all damages and accidents caused due to negligence in this regard.

It will be the entire responsibility of the contractor to protect the work(s) carried out by them including the fittings, fixtures and other accessories provided by them till the entire work is satisfactorily handed over to the Department / Users.

31. DEPARTMENT'S DRAWINGS, SPECIFICATIONS, PROTO-TYPE ETC. : All drawings, specifications, patterns, samples, models and proto-types furnished to the contractor by the Department are intended to be complementary and to provide for and comprise everything necessary for the completion of work / supply and are the property of the Department. These are not to be used for any work or purpose other than those for which these have been provided and shall be returned to the Department immediately on completion of work / supply in good condition.

32. CONFIDENTIAL INFORMATION : The drawings, specifications, proto-type, samples and such other information furnished to the contractor relating to the supply / work, sub-systems / equipment etc. are to be treated as confidential which shall be held by the contractor in confidence and shall not be divulged to any third party without the prior written consent of the Department. The contractor, therefore, binds himself, his successors, heirs, executors, administrators, employees and the permitted assignees or such other persons or agents directly or indirectly concerned with the work / supply to the confidential nature of the drawings, specifications, proto-type samples etc. It is a further condition of the contract that the contractor shall not, without prior written permission from the Department, transmit, transfer, exchange, gift or communicate any such confidential information, and also the component, sub assembly, products, by-products etc. pursuant to the fabrication under taken by the contractor, to any third party.

32. (a) Patents and Patent Rights Indemnification : All specifications, drawings, patents and such other relevant information furnished to the contractor by the Department shall be the property of the Department. If, during the process of execution of the contract, any improvement, refinement or technical changes and modifications are effected by the contractor, such changes shall not affect the title to the property of the Department and all the information, specifications, drawings etc. including the improvement / modifications, effected by the contractor shall continue to be the property of the Department. The Department shall also have the absolute right to assign, transfer, sublet, use and transmit all such information and details to the Department's consultants, agents and collaborators and the contractor shall not have any claim or rights whatsoever in respect of the Department's drawings, specifications, patents, prototypes etc. even where improvement, refinement, modifications etc. were effected by the contractor.

(b) Endorsement to be made by the Contractor on Fabrication Drawings for the protection of Departments Interest : "This design / drawing is the property of the and it must be returned with the tender / quotation or upon delivery of the materials / equipment and must not be used except with the permission of the owner".

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SECTION - 6 - SAFETY CODE :

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

2) Scaffolding or staging more than 3.6 m. (12 feet) above the ground or floor, swung or suspended from an over head support or erected with stationary support shall have a guard rail properly attached or bolted, braced and otherwise secured atleast 90 cm. (3 feet) high above the floor or platform of such scaffolding or staging and extending along the entire length of the out side and ends thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

3) Working platform, gangways, and stairways should be so constructed that they should not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6 m. (12 feet) above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (ii) above.

4) Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm. (3 feet).

5) Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m in length while the width between side rails in rung ladder shall in no case be less than 29 cm for ladder up to and including 3 m in length. For longer ladders this width should be increased at least 1/4" for each additional 30 cm of length. Uniform step spacing or not more than 30 cm. shall be kept. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites or work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lights to protect the public from accident, and shall be bound to bear the expenses of defense of every suit, action or other proceedings at law that may be brought by any persons for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit, action or proceedings to any such persons or which may, with the consent of the contractor, be paid to compensate any claim by any such person.

6) **Excavation and trenching :** All trenches, 1.2 m or more in depth, shall at all times be supplied with atleast one ladder for each 30 m in length or fraction thereof, Ladder shall extend from bottom of the trench to at least 90 cm above the surface of the ground. The side of the trenches which are 1.5 m or more in the depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5 m of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or under cutting shall be done.

7) **Demolition :** Before any demolition work is commenced and also during the progress of the work:—

i) All roads and open areas adjacent to the work site shall either be closed or suitably protected.

ii) No electric cable or apparatus which is liable to be a source of danger or a cable or apparatus used by the operator shall remain electrically charged.

iii) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.

8) All necessary personal safety equipment as considered adequate by the Engineer-in-Charge should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate steps to ensure proper use of equipment by those concerned: The following safety equipments shall invariably be provided:

i) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.

ii) Those engaged in white washing and mixing or stacking of cement bags or any material which is injurious to the eyes shall be provided with protective goggles.

iii) Those engaged in welding works shall be provided with welders protective eye shields.

iv) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

v) When workers are employed in sewers and manholes, which are in active use, the contractors shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public.

In addition the contractor shall ensure that the following safety measures are adhered to:

a) Entry for workers into the line shall not be allowed except under supervision of the EIC or his representative.

b) At least 5 to 6 manholes upstream and downstream should be kept open for at least 2 to 3 hours before any man is allowed to enter into the manhole for working inside.

c) Before entry, presence of Toxic gases should be tested by inserting wet lead acetate paper which changes colour in the presence of such gases and gives indication of their presence

d) Presence of Oxygen should be verified by lowering a detector lamp into the manhole. In case, no Oxygen is found inside the sewer line, workers should be sent only with Oxygen kit.

e) Safety belt with rope should be provided to the workers. While working inside the manholes, such rope should be handled by two men standing outside to enable him to be pulled out during emergency.

f) The area should be barricaded or cordoned of by suitable means to avoid mishaps of any kind. Proper warning signs should be displayed for the safety of the public whenever cleaning works are undertaken during night or day.

g) No smoking or open flames shall be allowed near the blocked manhole being cleaned.

h) The malba obtained on account of cleaning of blocked manholes and sewer lines should be immediately removed to avoid accidents on account of slippery nature of the malba.

i) Workers should not be allowed to work inside the manhole continuously. He should be given rest intermittently. The Engineer-in-Charge may decide the time up to which a worker may be allowed to work continuously inside the manhole.

j) Gas masks with Oxygen Cylinder should be kept at site for use in emergency.

k) Air-blowers should be used for flow of fresh air through the manholes. Whenever called for, portable air blower are recommended for ventilating the manholes. The motors for which shall be vapour proof and of totally enclosed type. Non sparking gas engines also could be used but they should be placed at least 2 metres away from the opening and on the leeward side protected from wind so that they will not be a source of friction on any inflammable gas that might be present.

l) The workers engaged for cleaning the manholes / sewers should be properly trained before allowing to work in the manhole.

m) The workers shall be provided with gum-boots or non-sparking shoes bump helmets and glows gas masks and non-sparking tools safety lights and gas masks and portable air blowers (when necessary). They must be supplied with barrier cream for anointing the limbs before working inside the sewer line.

n) Workmen descending a manhole shall try each ladder stop or rung carefully before putting his full weight on it to guard against insecure fastening due to corrosion of the rungs fixed to manhole.

o) If a man has received a physical injury, he should be brought out of the sewer immediately and adequate medical aid should be provided to him.

p) The extent to which these precautions are to be taken depend on individual situation but the decision of the Engineer-in-Charge regarding the steps to be taken in this regard in an individual case will be final.

vi) The contractor shall not employ men and women below the age of 18 years the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following precautions should be taken:

i. No paint containing lead or lead products shall be used except in the form of paste or ready made paint.

ii. Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.

iii. Overalls shall be supplied by the contractors to the workmen and adequate facilities shall be provided to enable the working painters to wash during and on cessation of work.

9) The Contractor shall not employ women and men below the age of 18 on the work of painting with product containing lead in any form, wherever men above the age of 18 are employed on the work of lead painting, the following principles must be observed for such use

i) White lead, sulphate of lead, or product containing these pigment, shall not be used in painting operation, except in the form of paste or of paint ready for use.

ii) Measures shall be taken, wherever required in order to prevent danger arising from the application of a paint in the form of spray.

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iii) Measures shall be taken, wherever practicable, to prevent danger arising out of from dust caused by dry rubbing down and scrapping.

iv) Adequate facilities shall be provided to enable working painters to wash during and on cessation of work.

v) Overalls shall be worn by working painters during the whole of the working period.

vi) Suitable arrangements shall be made to prevent clothing put off during working hours, being soiled by painting materials.

vii) Cases of lead poisoning and suspected lead poisoning shall be notified and shall be subsequently verified by a medical man appointed by the competent authority of the Department.

viii) The may require, when necessary, medical examination of workers.

xi) Instruction with regard to special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

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

11) Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following standards or conditions:

i) a) These shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept repaired and in good working order.

b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.

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

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

iv). In case of departmental machines, the safe working load shall be notified by the Electrical Engineer-in-Charge. As regards contractors machines the contractors shall notify the safe working load of the machine to the Engineer-in-Charge whenever he brings any machinery to site of work and get it verified by the Electrical Engineer concerned.

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

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

14) These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.

15) To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer or Engineer-in-Charge of the Department or their representatives.

16) Notwithstanding the above clauses from (i) to (xiv) there is nothing in these to exempt the contractor from the operations of any other Act or Rule in force in the Republic of India.

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SECTION - 7 : SAFETY WITH SCAFFOLDING :

INTRODUCTION :

1. Following paragraphs deals with the safety regulations and precautions to be followed in the construction use, maintenance, etc. of scaffolds. This will serve as a guide to users of scaffolds in the construction and maintenance operations.

2. Suitable scaffolds are used for performing work that cannot be done from the ground, part of a permanent structure, a ladder or other available means of support.

Scaffolds are used in many construction and maintenance operations. Fall of person is the most common hazard accompanying the use of scaffolds because of the height usually involved.

1. General Requirements :

1.1 Every scaffold and its supporting members should be designed to support given load, with a safety factor of at least four. No alterations should be made that might impair the strength of such structures, no improvised, make-shift or substandard scaffold should be permitted even for the most temporary use.

1.2 All work in connection with such structures, including construction, alteration and removal should be carefully done under the direction and supervision of persons who have had experience in such works.

2. Materials of Construction :

2.1. Every scaffold and every part thereof, including supports, should be of good construction, sound material, of adequate strength for the purpose which it is meant to be used and should be properly maintained.

Planks should be laid flat with an overlap, lengthwise, of at least 30 cm. with the centre of the overlap directly over a bearer. Boards and planks used for the floors should be of uniform thickness, closely laid and securely fastened in place.

2.2 All lumber used in the construction of scaffolds should be sound, straight-grained, free from cross-grains, shakes and loose or dead knots. It should also be free from dry rot, large checks, worm holes, or other defects impairing its strength or durability.

2.3 All nails used in the construction of scaffolds, staging and supports should be of ample size and used in sufficient quantities at each connection to develop the designed strength of scaffold. Nails should penetrate to the holding piece to a depth of at least 12 times the diameter of nail.

2.4 Barrels, boxes, loose tile blocks, loose piles of bricks or other unstable objects should not be used to support planks used as working platforms.

3. Platforms, Railings and Tee-Boards :

3.1 The minimum uniformly distributed design load per Sq. m. of platforms should be 250 kg. Any concentrated load at any point in the span should not exceed the designed uniformly distributed load. Planks should not be less than 50 mm thick.

3.2 The rear of outer side of every scaffolding, platform and ramp more than 2M above the surrounding ground or solid construction, or adjacent to deep holes, excavations, railroad tracks, high tension electrical wires, should be provided with a substantial guard rail of standard construction consisting of top and intermediate rails, and toe-boards all supported by posts and securely connected to scaffold at intervals of not more than 2.4 M (See figure - 1).

3.3 The width of the scaffolds should be such as to provide a clear walkway 50 cm. wide. If part of the width of scaffold is to be used for keeping materials such as brick, mortar or lumber, the scaffold should be made wider so as to provide a walkway of the required width.

3.4 Where scaffolds are erected over side walks or over areas in which persons must work or pass, the space between the railing and toe-board should be fitted with side screens.

3.5 There should be a screen or other protection suspended from the scaffold to catch materials that may fall from above. Screens should extend beyond the edge of the scaffold to catch any materials that may fall over the edges.

4. Means of Access :

4.1 A safe and convenient means of access should be provided to the platform or scaffold. This requirement does not apply to swinging scaffolds or those with convenient access from adjacent floors (see figure - 2).

Means of access may be a portable ladder, fixed ladder, ramp or it may be a stairway. The use of cross braces or frame work as means of access to the working surface should not be permitted.

4.2 If scaffolds are to be used to a great extent or for a long period of time, a regular plank stairway, wide enough to allow two persons to pass, should be erected. Such stairways should have handrails on both sides.

4.2.1 No stairway or run of slope exceeding 2 in 3 should be used.

4.2.2 Where the slope of a stairway or run renders additional foot hold necessary, and in every case where the slope is more than 1 in 4, there should be provided proper stepping laths which should:

a) have a minimum section of 50 x 30 mm and be placed at maximum interval of 45 cm and

b) be of length to cover the full width of the stairway of run except that they may be interrupted over a width of not more than 10 cm to facilitate the movement of barrows.

5. Overhead Protection :

5.1 Overhead protection should be provided on the scaffold whenever persons are working at higher places. This protection should be not more than 3m above the scaffold floor and should be of planks or other suitable materials.

6. Use of Scaffolds :

6.1 Good housekeeping should be maintained at all times upon scaffolding, platforms and ramps. Excessive storage of materials thereon should be avoided. Care must be taken to avoid accumulating of small objects, such as boards, tools, pieces of reinforcing steel, waste concrete which may easily be disturbed on knock off. Hand rails should be kept in good repair and securely nailed or otherwise fastened down. Scaffold should be cleared of all tools, materials and rubbish at the end of each working day/shift.

6.2 Persons should not be permitted on scaffolds when the platform or guard rails are slippery. Persons should not be permitted to work on scaffolds during a storm or strong winds.

6.3 Suspended scaffolds should never be used for the storage of stone or heavy materials. Two or more swinging scaffolds should not at any time be combined into one by bridging the distance between them with planks or any other form of connection. Life lines securely fastened from above should be provided for each person working on a swinging scaffold. Safety belts should be tied to the life lines (See figure - 3).

7. Inspection :

7.1 As scaffolds have to remain in position normally for many weeks, they must be inspected at least once a week to make sure that nothing has gone wrong since erection. In addition, they must always be inspected after a spell of bad weather which might have affected their stability.

7.2 The inspections must be carried out by some one who knows the faults to look for and how they may be put right. It is important to know that the work of inspection has been completed and what faults have been found, the results of each inspection must, therefore be recorded. Any scaffold damaged or weakened from any cause should be immediately repaired and persons should not be allowed to use it until repairs have been completed.

8. Dismantling :

8.1 The dismantling of scaffold should be carefully done under experienced supervision. Care should be taken not to drop small, loose objects when removing scaffold planks. All nails should be promptly removed from scaffold planks and the planks safely piled.

9. Precautions against particular Hazards :

9.1 Care should be taken to see that no uninsulated electric wire exists within 3M. of the working platform, stairways, etc. of the scaffold.

9.2 While carrying bars, rods or pipes of any conducting material of length greater than 3 M. in the vicinity of electric wires, special care should be taken that these bars do not touch the electric wires.

9.3 Care should be taken against any possibility of wooden scaffold catching fire. In suspended scaffolds, if a blow torch or other flame is used for removing paints, only wire ropes not less than 10mm in diameter should be used.

9.4 Care should be taken to see that no part of a scaffold is struck by a truck or other heavy moving equipment and no material should be dumped against it.

9.5 Scaffolds on thoroughfare should be provided with light.

9.6 Access to cable tunnels, hydrants, etc. should remain free at all times.

9.7 Care should be taken from damaging under ground cables and equipment. This is specially important when parts of scaffolds for other fasteners have to be driven in the ground.

SECTION - 8 : MODEL RULES FOR THE PROTECTION OF HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS EMPLOYED BY ICTS. OR ITS CONTRACTORS :

1. **Application :** These rules shall apply to all buildings and construction works in charge of Department in which twenty or more workers are ordinarily employed or are proposed to be employed in any day during the period during which the contract work is in progress.

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2. **Definition :** Work place means a place where twenty or more workers are ordinarily employed in connection with construction work on any day during the period during which the contract work is in progress.

3. **First-Aid Facilities :**

(1) At every work place there shall be provided and maintained, so as to be easily accessible during working hours, first-aid boxes at the rate of not less than one box for 150 contract labour or part thereof ordinarily employed.

(2) The first-aid box shall be distinctly marked with a red cross on white back ground and shall contain the following equipment, namely:

a) For work places in which the number of contract labour employed does not exceed 50. Each first-aid box shall contain the following equipments:

(i) 6 small sterilised dressings.

(ii) 3 medium size sterilised dressings.

(iii) 3 large size sterilised dressings.

(iv) 3 large sterilised burn dressings.

(v) 1 (30 ml.) bottle containing a two per cent alcoholic solution of iodine.

(vi) 1 (30 ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.

(vii) 1 snake-bite lancet.

(viii) 1 (30 gms.) bottles of potassium permanganate crystals.

(ix) 1 pair scissors.

(x) 1 copy of the first-aid leaflet issued by the Director General, Factory Advice Service and Labour Institutes, ICTS-TIFR.

(xi) 1 bottle containing 100 tablets (each of 5 gms.) of aspirin.

(xii) Ointment for burns.

(xiii) A bottle of suitable surgical antiseptic solution.

b) For work places in which the number of contract labour exceeds 50. Each first-aid box shall contain the following equipments:

(i) 12 small sterilised dressings.

(ii) 6 medium size sterilised dressings.

(iii) 6 large size sterilised dressings.

(iv) 6 large size sterilised burn dressings.

(v) 6 (15 gms.) packets sterilised cotton wool.

(vi) 1 (60 ml.) bottle containing a two per cent alcoholic solution of iodine.

(vii) 1 (60 ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.

(viii) 1 roll of adhesive plaster.

(ix) 1 snake-bite lancet.

(x) 1 (30 gms.) bottle of potassium permanganate crystals.

(xi) 1 pair scissors.

(xii) 1 copy of the First-Aid leaflet issued by the Director General, Factory Advice Service and Labour Institute, ICTS-TIFR.

(xiii) A bottle containing 100 tablets (each of 5 gms.) of aspirin.

(xiv) Ointment for burns.

(xv) A bottle of suitable surgical antiseptic solution.

(3) Adequate arrangements shall be made for immediate recoupment of the equipment when necessary.

(4) Nothing except the prescribed contents shall be kept in the first aid box.

(5) The First-Aid box shall be kept in charge of a responsible person who shall always be readily available during the working hours of the work place.

(6) A person in charge of the First-Aid box shall be a person trained in First-Aid treatment, in work places where the number of contract labour employed is 150 or more.

(7) In work places where the number of contract labour employed is 500 or more and hospital facilities are not available within easy distance from the works, First-Aid posts shall be established and run by a trained compounder. The compounder shall be on duty and shall be available at all hours when the workers are at work.

(8) Where work places are situated in places which are not towns or cities, a suitable motor transport shall be kept readily available to carry injured person or persons suddenly taken ill to the nearest hospital.

4. Drinking water :

(i) In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.

(ii) Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.

(iii) Every water supply or storage shall be at a distance of not less than 50 feet from any latrine, drain or other source of pollution. Where water has to be drawn from an existing well which is within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with a trap-door which shall be dust and water proof.

(iv) A reliable pump shall be fitted to each covered well, the trap-door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

5. Washing facilities :

(i). In every work place adequate and suitable facilities for washing shall be provided and maintained for the use of contract labour employed therein.

(ii). Separate and adequate cleaning facilities shall be provided for the use of male and female workers.

(iii). Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition.

6. Latrines and Urinals :

(i). Latrines shall be provided in every work place on the following scale, namely:

a) Where females are employed, there shall be at least one latrine for every 25 females.

b) Where males are employed, there shall be at least one latrine for every 25 males.

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

(ii) Every latrine shall be under cover and so partitioned off as to secure privacy and shall have a proper door and fastening.

(iii) **Construction of latrines :** The inside walls shall be constructed of masonry or some suitable heat resisting non-absorbent materials and shall be cement washed inside and outside at least once a year. Latrines shall not be of a standard lower than bore-hole system.

(iv) a) Where workers of both sexes are employed, there shall be displayed out side each block of latrine and urinal, a notice in the language understood by the majority of the workers “For Men only” or “For Women only” as the case may be.

b) The notice shall also bear the figure of a man or of a woman, as the case may be.

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

(vi) a) The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.

b) Latrines and urinals other than those connected with a flush sewerage system shall comply with the requirements of the Public Health Authorities.

(vii) Water shall be provided by means of a tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.

(viii) **Disposal of excreta** : Unless otherwise arranged for by the local sanitary authority, arrangements for proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator. Alternately excreta may be disposed off by putting a layer of night soil at the bottom of a pucca tank prepared for the purpose and covering it with a 15 cm. layer of waste or refuse and then covering it with a layer of earth for a fortnight (when it will turn into manure).

(ix) The contractor shall, at his own expense, carry out all instructions issued to him by the Engineer-in-Charge to effect proper disposal of night soil and other conservancy work in respect of the contractor's workmen or employees on the site. The contractor shall be responsible for payment of any charges which may be levied by Municipal or Cantonment Authority for execution of such work on his behalf.

7. Provision of shelter during rest : At every place there shall be provided, free of cost, four suitable sheds, two for meals, and the other two for rest separately for the use of men and women labour. The height of each shelter shall not be less than 3 metres from the floor level to the lowest part of the roof. These shall be kept clean and the space provided shall be on the basis of 0.6 Sq.m. per head.

8. Creches :

i) At every work place at which 20 or more women workers are ordinarily employed, there shall be provided two rooms of reasonable dimensions for the use of their children under the age of six years. One room shall be used as a play room for the children and the other as their bed-room. The rooms shall be constructed with specification as per Clause – 19-H (ii) a, b & c.

ii) The rooms shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean.

iii) The contractor shall supply adequate number of toys and games in the play rooms and sufficient number of cots and beddings in the bed room.

iv) The contractor shall provide one Ayaa / Dai to look after the children in the creche when the number of women workers does not exceed 50 and two Dais when the number of women workers exceeds 50.

v) The use of the rooms earmarked as creches shall be restricted to children, their attendants and mothers of the children.

9. Canteens :

(i) In every work place where the work regarding the employment of contract labour is likely to continue for six months and wherein contract labour numbering one hundred or more are ordinarily employed, an adequate canteen shall be provided by the contractor for the use of such contract labour.

(ii) The canteen shall be maintained by the contractor in an efficient manner.

(iii) The canteen shall consist of at least a dining hall, kitchen, store room, pantry and washing places separately for workers and utensils.

(iv) The canteen shall be sufficiently lighted at all times when any person has access to it.

(v) The floor shall be made of smooth and impervious material and inside walls shall be lime washed or colour washed at least once in each year:

Provided that the inside walls of the kitchen shall be lime washed every four months.

(vi) The premises of the canteen shall be maintained in a clean and sanitary condition.

(vii) Waste water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause a nuisance.

(viii) Suitable arrangement shall be made for the collection and disposal of garbage.

(ix) The dining hall shall accommodate at a time 30 per cent of the contractor labour working at a time.

(x) The floor area of the dining hall, excluding the area occupied by the service counter and any furniture except tables and chairs shall not be less than one square metre per diner to be accommodated as prescribed in sub-rule (ix).

(xi) a) A portion of the dining hall and service counter shall be partitioned off and reserved for women workers, in proportion to their number.

b) Washing places for women shall be separate and screened to secure privacy.

(xii) Sufficient tables, stools, chairs or benches shall be available for the number of diners to be accommodated as prescribed in sub-rule (ix).

(xiii) (a) (1) There shall be provided and maintained sufficient utensils, crockery, furniture and any other equipments necessary for the efficient running of the canteen.

(a) (2) The furniture, utensils and other equipments shall be maintained in a clean and hygienic condition.

(b) (1) Suitable clean clothes for the employees serving in the canteen shall be provided and maintained.

(b) (2) A service counter, if provided, shall have top of smooth and impervious material.

(b) (3) Suitable facilities including an adequate supply of hot water shall be provided for the cleaning of utensils and equipments.

(xiv) The food stuffs and other items to be served in the canteen shall be in conformity with the normal habits of the contract labour.

(xv) The charges for food stuffs, beverages, and any other items served in the canteen shall be based on No profit, No loss and shall be conspicuously displayed in the canteen.

(xvi) In arriving at the price of food stuffs and other articles served in the canteen, the following items shall not be taken into consideration as expenditure, namely:—

(a) The rent of land and buildings;

(b) The depreciation and maintenance charges for the building and equipments provided for the canteen;

(c) The cost of purchase, repairs and replacement of equipments including furniture, crockery, cutlery and utensils;

(d) The water charges and other charges incurred for lighting and ventilation;

(e) The interest and amounts spent on the provision and maintenance and equipments provided for the canteen.

(xvii) The accounts pertaining to the canteen shall be audited once every 12 months by registered accountants and auditors.

10. Anti-Malarial Precautions : The contractor shall at his own expense, conform to all anti-malarial instructions given to him by the Engineer-in-Charge including the filling up of any borrow pits which may have been dug by him.

11. Amendments : Government may, from time to time, add to or amend these rules and issue directions it may consider necessary for the purpose of removing any difficulty which may arise in the administration thereof.

SECTION-9: CONTRACTOR'S LABOUR REGULATIONS

1. Short Title :

These regulations may be called the " Contractors. Labour Regulations".

2. Definitions :

i) **"Workmen"** means any person employed by the or its Contractor directly or indirectly through a sub-contractor, with or without the knowledge of the , to do any skilled, semi-skilled or unskilled manual, supervisory, technical or clerical work for hire or reward, whether the terms of employment are expressed or implied but does not include any person—

a) Who is employed mainly in a managerial or administrative capacity; or

b) Who, being employed in a supervisory capacity draws wages exceeding five hundred rupees per mensem or exercise either by the nature of the duties attached to the office or by reason of powers vested in him, functions mainly of managerial nature; or

c) Who is an out worker, that is to say, a person to whom any article or materials are given out by or on behalf of the principal employer to be made up, cleaned, washed, altered, ornamental finished, repaired, adopted

or otherwise processed for sale for the purposes of the trade or business of the principal employer and the process is to be carried out either in the home of the out worker or in some other premises, not being premises under the Control and management of the principal employer.

ii) **"Fair Wages"** means wages whether for time or piece work fixed and notified under the provisions of the Minimum Wages Act from time to time.

iii) **"Contractors"** shall include every person who undertakes to produce a given result other than a mere supply of goods or articles of manufacture through contract labour or who supplies contract labour for any work and includes a sub-contractor.

iv) **"Wages"** shall have the same meaning as defined in the payment of wages act.

3 (i) Normally working hours of an adult employee should not exceed 9 hours a day. The working day shall be so arranged that inclusive of interval for rest, if any, it shall not spread over more than 12 hours on any day.

(ii) When an adult worker is made to work for more than 9 hours on any day or for more than 48 hours in any week, he shall be paid over time for the extra hours put in by him at double the ordinary rate of wages.

(iii) a) Every worker shall be given a weekly holiday normally on a Sunday, in accordance with the provisions of the Minimum Wages (Central) Rules, 1960 as amended from time to time irrespective of whether such worker is governed by the Minimum Wages Act or not.

(iii) b) Where the Minimum Wages prescribed by the Government under the Minimum Wages Act are not inclusive of the wages for the weekly day of rest, the worker shall be entitled to rest day wages at the rate applicable to the next preceding day, provided he has worked under the same contractor for a continuous period of not less than 6 days.

(iii) c) Where a contractor is permitted by the Engineer-in-Charge to allow a worker to work on a normal weekly holiday, he shall grant a substituted holiday to him for the whole day on one of the five days immediately before or after the normal weekly holiday and pay wages to such worker for the work performed on the normal weekly holiday at over time rate.

4. Display of Notice regarding wages etc. :

The contractor shall before he commences his work on contract, display and correctly maintain and continue to display and correctly maintain in a clear and legible condition in conspicuous places on the work, notices in English and in the local Indian languages spoken by the majority of the workers, giving the minimum rates of wages fixed under the Minimum Wages Act, the actual wages being paid, the hours of work for which such wages are earned, wage periods, dates of payment of wages and other relevant information as per **Appendix - III.**

5. Payment of Wages :

(i) The contractor shall fix wage periods in respect of which wages shall be payable.

(ii) No wage period shall exceed one month.

(iii) The wages of every person employed as contract labour in an establishment or by a contractor where less than one thousand, such persons are employed shall be paid before the expiry of the seventh day and in other cases before the expiry of tenth day after the last day of the wage period in respect of which the wages are payable.

(iv) Where the employment of any worker is terminated by or on behalf of the contractor, the wages earned by him shall be paid before the expiry of the second working day from the date on which his employment is terminated.

(v) All payments of wages shall be made on a working day at the work premises and during the working time and on a date notified in advance and in case the work is completed before the expiry of the wage period, final payment shall be made within 48 hours of the last working day.

(vi) Wages due to every worker shall be paid to him direct or to other person authorised by him in this behalf.

(vii) All wages shall be paid in current coin or currency or in both.

(viii) Wages shall be paid without any deductions of any kind except those specified by the Central Government by general or special order in this behalf or permissible under the payment of Wages Act, 1956.

(ix) A notice showing the wages period and the place and time of disbursement of wages shall be displayed at the place of work and a copy sent by the contractor to the Engineer-in-Charge under acknowledgement.

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(x) It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the Engineer-in-Charge or any other authorised representative of the Engineer-in-Charge who will be required to be present at the place and time of disbursement of wages by the contractor to workmen.

(xi) The contractor shall obtain from the Engineer-in-Charge or any other authorised representative of the Engineer-in-Charge as the case may be, a certificate under his signature at the end of the entries in the “Register of wages” or the “Wage-cum-Muster Roll” as the case may be in the following form :

"Certified that the amount shown in column No .....has been paid to the workman concerned in my presence on ..... at....."

6. FINES AND DEDUCTIONS WHICH MAY BE MADE FROM WAGES:

(i) The wages of a worker shall be paid to him without any deductions of any kind except the following::

a) Fines.

b) Deductions for absence from duty i.e. from the place or the places where by the terms of his employment he is required to work. The amount of deduction shall be in proportion to the period for which he was absent.

c) Deduction for damage to or loss of goods expressly entrusted to the employed person for custody, or for loss of money or any other deduction which he is required to account, where such damage or loss is directly attributable to his neglect or default.

d) Deduction for recovery of advances or for adjustment of over-payment of wages; advances granted shall be entered in a register.

e) Any other deduction which the Central Government may from time to time allow.

(ii) No fines should be imposed on any worker save in respect of such acts and omissions on his part as have been approved of by the Chief Labour Commissioner.

Note: An approved list of acts and omissions for which fines can be imposed is enclosed at **Appendix-X.**

(iii) No fine shall be imposed on a worker and no deduction for damage or loss shall be made from his wages until the worker has been given an opportunity of showing cause against such fines or deductions.

(iv) The total amount of fine which may be imposed in any one wage period on a worker shall not exceed an amount equal to three paise in a rupee of the total wages, payable to him in respect of that wage period.

(v) No fine imposed on any worker shall be recovered from him by instalment, or after the expiry of sixty days from the date on which it was imposed.

(vi) Every fine shall be deemed to have been imposed on the day of the act or omission in respect of which it was imposed.

7. Labour Records:

(i.) The contractor shall maintain a "**Register of persons employed**" on work on contract in Form XIII of the CL (R&A) Central Rules, 1971 **(Appendix-IV).**

(ii.) The contractor shall maintain a **"Muster Roll**" register in respect of all workmen employed by him on the work under contract in form XVI of the CL (R&A) Rules, 1971 **(Appendix-V).**

(iii.) The contractor shall maintain a **"Wage Register**" in respect of all workmen employed by him on the work under contract in form XVII of the CL (R&A) Rules, 1971 **(Appendix-VI).**

(iv.) **Register of accidents**: The contractor shall maintain a register of accidents in such form as may be convenient at the work place but the same shall include the following particulars:

a) Full particulars of the labourers who met with accident.

b) Rate of wages.

c) Sex.

d) Age.

e) Nature of accident and cause of accident.

f) Time and date of accident.

g) Date and time when admitted in Hospital.

h) Date of discharge from Hospital.

i) Period of treatment and result of treatment.

j) Percentage of loss of earning capacity and disability as assessed by Medical Officer.

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k) Claim required to be paid under workmen's Compensation Act.

l) Date of payment of compensation.

m) Amount paid with details of the person to whom the same was paid.

n) Authority by whom the compensation was assessed.

o) Remarks.

(v) **Register of Fines**: The contractor shall maintain a "Register of Fines" in the form XII of the CL (R&A) Rules, 1971 **(Appendix-XI).**

The contractor shall display in a good condition and in a conspicuous place of work the approved list of Acts and omissions for which fines can be imposed **(Appendix-X).**

(vi) **Register of Deductions**: The contractor shall maintain a "Register of deductions for damage or loss" in Form XX of the CL (R&A) Rules, 1971 **(Appendix-XII).**

(vii) **Register of Advances**: The contractor shall maintain a "Register of Advances" in form XXII of the CL (R&A) Rules, 1971 **(Appendix-XIII).**

(viii) **Register of Overtime**: The contractor shall maintain a "Register of Overtime" in form XXIII of the CL (R&A) Rules, 1971 **(Appendix-XIV).**

8. Attendance Card-cum-Wage slip:

(i) The contractor shall issue an attendance card-cum-wage slip to each workman employed by him in the specimen form at **(Appendix-VII).**

(ii) The card shall be valid for each wage period.

(iii) The contractor shall mark the attendance of each workman on the card twice each day, once at the commencement of the day and again after the rest interval, before he actually starts work.

(iv) The card shall remain in possession of the worker during the wage period under reference.

(v) The contractor shall complete the wage slip portion on the reverse of the card at least a day prior to the disbursement of wages in respect of the wage period under reference.

(vi) The contractor shall obtain the signature or thumb impression of the worker on the wage slip at the time of disbursement of wages and retain the card with himself.

9. Employment Card:

The contractor shall issue an Employment Card in form XIV of the CL (R&A) Central Rules, 1971 to each worker within three days of the employment of the worker **(Appendix-VIII).**

10. Service Certificate:

On termination of employment for any reason whatsoever the contractor shall issue to the workman whose services have been terminated, a service certificate in form XV of the CL (R&A) Central Rules, 1971 **(Appendix-IX).**

11. Preservation of Labour Records:

All records required to be maintained under Regulations Nos. 6 and 7 shall be preserved in original for a period of three years from the date of last entries made in them and shall be made available for inspection by the Engineer-in-Charge or Labour Officer or any other officers authorised by the Department in this behalf.

12. Power of Labour Officers to make investigations or enquiry:

The Labour Officer or any other person authorised by Central Government on their behalf shall have power to make enquiries with a view to ascertaining and enforcing due and proper, observance of the Fair Wages Clauses and the Provisions of Regulations. He shall investigate into any complaint regarding the default made by the contractor or sub-contractor in regard to such provision.

13. Report of Labour Officer:

The Labour Officer or other persons authorised as aforesaid shall submit a report of result of his investigation or enquiry to the Engineer-in-Charge concerned indicating the extent, if any, to which the default has been committed with a note that necessary deductions from the contractor's bill be made and the wages and other dues be paid to the labourers concerned. In case an appeal is made by the contractor under Clause 13 of these regulations, actual payment to labourers will be made by the Engineer-in-Charge after the Project Engineer has given his decision on such appeal.

(i) The Engineer-in-Charge shall arrange payments to the labour concerned within 45 days from the receipt of the report from the Labour Officer or the Project Engineer as the case may be.

14. Appeal against the decision of Labour Officer:

Any person aggrieved by the decision and recommendations of the Labour Officer or other person so authorised may appeal against such decision to the Project Engineer concerned within 30 days from the date of decision, forwarding simultaneously a copy of his appeal to the Engineer-in-Charge concerned but subject to such appeal, the decision of the Officer shall be final and binding upon the contractor.

15. Prohibition regarding representation through lawyers:

(i) A workman shall be entitled to be represented in any investigation or enquiry under these regulations by :

(a) An officer of a registered trade union of which he is a member.

b) An officer of a federation of trade unions to which the trade union referred to in clause (a) is affiliated.

c) Where the employer is not a member of any registered trade union, by an officer of a registered trade union, connected with the industry in which the worker is employed or by any other workman employed in the industry in which the worker is employed.

(ii) An employer shall be entitled to be represented in any investigation or enquiry under these regulations by

a) An officer of an association of employers of which he is a member.

b) An officer of a federation of associations of employers to which association referred to in Clause (a) is affiliated.

c) Where the employer is not a member of any association of employers, by an officer of association of employer, connected with the industry in which the employer is engaged or by any other employer, engaged in the industry in which the employer is engaged.

.(iii) No party shall be entitled to be represented by a legal practitioner in any investigation or enquiry under these regulations.

16. Inspection of Books and slips:

The contractor shall allow inspection of all the prescribed labour records to any of his workers or to his agent at a convenient time and place after due notice is received or to the Labour Officer or any other person, authorised by the Central Government on his behalf.

17. Submission of Returns:

The contractor shall submit periodical returns as may be specified from time to time.

18. Amendments:

The Central Government may, from time to time, add to or amend the regulations and on any question as to the application, interpretation or effect of those regulations the decision of the Project Engineer concerned in that behalf shall be final.

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APPENDIX-I

REGISTER OF MATERNITY BENEFITS

(Clause 19 F of the conditions of contract)

Name and address of the contractor(s) : _____

Name and location of the work :_____

Name of the employee	Father's / Husband's Name	Nature of employment	Period of actual employment	Date on which notice of confinement given
1	2	3	4	5

Date of delivery / miscarriage	Date on which maternity leave commenced and ended			
	In case of Delivery		**In case of Mis-carriage**	
	Commenced	Ended	Commenced	Ended
6	7	8	9	10

Leave pay paid to the employee				Remarks
In case of delivery		In case of mis-carriage		
Rate of leave pay	Amount paid	Rate of leave pay	Amount paid	
11	12	13	14	15

APPENDIX-II

SPECIMEN FORM OF THE REGISTER, REGARDING MATERNITY BENEFIT ADMISSIBLE TO THE CONTRACTOR'S LABOUR IN ICTS. WORKS.

Name and location of the work :	
Name and address of the contractor :	

1.	Name of the woman and her husband's Name :	
2.	Designation :	
3.	Date of appointment :	
4.	Date with months and years in which she is employed :	
5.	Date of discharge/dismissal, if any :	
6.	Date of production of certificates in respect of pregnancy :	
7.	Date on which the woman informs about the expected delivery :	
8.	Date of delivery/Miscarriage/death :	
9.	Date of production of certificate in respect of delivery/miscarriage :	
10.	Date with the amount of maternity/death benefit paid in advance of expected delivery:	
11.	Date with the amount of subsequent payment of maternity benefit :	
12.	Name of the person nominated by the woman to receive the payment of the maternity benefit after her death.	

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13.	If the woman dies, the date of her death, the name of the person to whom maternity benefit amount was paid, the month thereof and the date of payment	
14.	Signature of the contractor authenticating entries in the register :	
15.	Remarks column for the use of Inspecting Officer :	

APPENDIX-III

LABOUR BOARD

1	Name of work:	
2	Name and address of contractor:	
3	Name and address of Division:	
4	Name and address of Labour Officer:	
5	Name and address of Labour Enforcement officer:	

S. NO.	CATEGORY	MINIMUM WAGE FIXED	ACTUAL WAGE PAID	NUMBER PRESENT	REMARKS

Weekly holiday :	
Wage period :	
Date of payment of wages :	
Working hours :	
Rest interval :	

Seal and Signature of Tenderer

APPENDIX-IV

FORM XIII

Register of workmen employed by contractor

Name and Address of contractor:

Name and Address of establishment in/under which contract is carried on:

Nature and Location of work:

Name and Address of Principal Employer:

Sl. Name and Age and Father's/ Nature of Permanent Local Date of Signature or Date of Reasons for Remarks

No. surname of sex husband's employment/home address of address commencement of thumb impression termination of termination workman Name designation the workman employment of the workman employment

(Village, Tehsil,

Taluka and Dist.)

1.

APPENDIX-V

FORM XVI

MUSTER ROLL

Name and address of contractor:

Name and address of establishment in/under which contract is carried on:

Nature and location of work:

Name and address of Principal Employer:

For the month of/fortnight:

Sl. Name of workmanFather's/Husband's Name Sex Dates Remarks

No.

1.

Seal and Signature of Tenderer

APPENDIX-VI

FORM XVII

REGISTER OF WAGES

Name and address of contractor:
Name and address of establishment in/under which contract is carried on:
Nature and location of work:
Name and address of Principal employer:
Wage period: Monthly/Fortnightly

Sl. No.	Name of workmen	Serial No. in the register of workmen	Designation/ nature of work	No. of days worked	Units of work done	Daily rate of wages/piece rate	Basic wages	Dearness allowances	Over-time	Other cash Payments (Nature of Payment to be indicated)	Total Amount of wages earned	Deductions if any	Net amount paid	Signature/ Thumb impression (Indicate nature)	Initial of contractor or his representative
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

APPENDIX-VII

(obverse)

Wage Card No.:

WAGE CARD

Name and address of contractor: Date of issue :
Name of work with location: Designation :
Name of workman: Month/Fortnight :
Rate of wages :
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31.
Morning: Rate:
Evening: Amount:
Initial:
Received from the sum of Rs. on account of my wages.
The Wage Card is valid for one month from the date of issue.
Signature

Seal and Signature of Tenderer

APPENDIX-VII
(reverse)

FORM XIX

WAGE SLIP

Name and address of contractor:	
Name and Fathers/Husbands name of workman:	
Nature and location of work:	
For the Week/Fortnight/Month ending:	

1	No. of days worked:	
2	No. of units worked in case of piece rate workers:	
3	Rate of daily wages/piece rate:	
4	Amount of overtime wages:	
5	Gross wages payable:	
6	Deductions, if any:	
7	Net amount of wages paid :	

Initials of the contractor or his representative

APPENDIX-VIII

FORM XIV

EMPLOYMENT CARD

Name and address of contractor:	
Name and address of establishment in/under:	
which contract is carried on	
Name of work and location of work:	
Name and address of Principal employer:	

1	Name of the workman:	
2	Sl. No. in the register of workman:	
3	employed	
4	Nature of employment/designation:	
5	Wage rate (with particulars of unit in:	
6	case of piece work)	
7	Wage period:	
8	Tenure of employment:	

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9	Remarks:	

Signature of contractor

APPENDIX-IX

FORM - XV

SERVICE CERTIFICATE

Name

Sl. no.	Category	Minimum Wage fixed	Actual wage paid	Number present	Remarks

Weekly holiday : _____

Wage period : _____

Date of payment of wages : _____

Working hours : _____

Rest interval : _____

Seal and Signature of Tenderer

LIST OF ACTS AND OMISSIONS FOR WHICH FINES CAN BE IMPOSED :

In accordance with rule 7(V) of the Contractor's Labour Regulations to be displayed prominently at the site of work in both English and local language.

1. Willful insubordination or disobedience, whether alone or in combination with other.

2. Theft, fraud or dishonesty in connection with the contractors beside a business or property of .

3. Taking or giving bribes or any illegal gratifications.

4. Habitual late attendance.

5. Drunkenness fighting, riotous or disorderly or indifferent behaviour.

6. Habitual negligence.

7. Smoking near or around the area where combustible or other materials are locked.

8. Habitual indiscipline.

9. Causing damage to work in the progress or to property of the or of the contractor.

10. Sleeping on duty.

11. Malingering or slowing down work.

12. Giving of false information regarding name, age, father's name etc.

13. Habitual loss of wage cards supplied by the employers.

14. Unauthorised use of employer's property for manufacture or making of unauthorised articles at the work place.

15. Bad workmanship in construction and maintenance by skilled workers which is not approved by the Department and for which the contractors are compelled to undertake rectifications.

16. Making false complaints and/or misleading statements.

17. Engaging on trade within the premises of the establishments.

18. Any unauthorised divulgence of business affairs of the employees.

19. Collection or canvassing for the collection of any money within the premises of an establishment unless authorised by the employer.

20. Holding meeting inside the premises without previous sanction of the employers.

21. Threatening or intimidating any workman or employee during the working hours within the premises.

Seal and Signature of Tenderer

APPENDIX-XI

FORM - XII

REGISTER OF FINES

Name and address of contractor:
Name and address of establishment in/under which contract is carried on:
Nature and location of work:
Name and address of Principal employer:

Sl. No.	Name of workman Husband's name	Father's/ Husband's employment	Designation/ nature of employment	Act/omission for which fine imposed	Date of offence showed cause against which fine was heard	Whether workman in whose presence explanation	Date and period of wages payable	Name of person showed employee's	Wage imposed	Amount of fine imposed	Date on which fine realised	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	

APPENDIX-XII

FORM - XX

REGISTER OF DEDUCTIONS FOR DAMAGE OR LOSS

Name and address of contractor:

Name & address of establishment in/under which contract is carried on:

Nature and location of work:

Name and address of Principal Employer:

Sr. No.	Name of workman Name	Father's/ Husband's employment	Designation/nature of employment	Particulars of damage or loss	Date of damage or loss	Whether workman in whose presence showed cause against employee's explanation was heard	Name of person employee's	Amount of deduction imposed	No. of instalments	Date of First instalment	Date of Last instalment	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13

Seal and Signature of Tenderer

APPENDIX-XIII

FORM - XXII

REGISTER OF ADVANCES

Name and address of contractor:

Name & address of establishment in/under which contract is carried on:

Nature and location of work:

Name and address of Principal Employer:

Sl. Name Father's/ Designation/ Wage period Date and Purpose(s) No. of ins- Date and Date on Remarks

No. husband's nature of and wages amount of for which talments by amount which last

name employment payable advance advance which of each instalment

givenmade advance instalment was

to be repaid repaid

repaid

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11.

APPENDIX-XIV

FORM - XXIII

REGISTER OF OVERTIME

Name and address of contractor:

Name and address of establishment in/under which contract is carried on:

Nature and location of work:

Name and address of Principal Employer:

Sl. Name of workman Father's/ Sex Designation/ Dates on Total over Normal Overtime Overtime Rate on Remarks

No. Husband's nature of which time worked rate of rate of earnings which

name employment overtime or produc- wages wages overtime

worked tion in case wages

of piece paid

rated work

1 2 3 4 5 6 7 8 9 10 11 12

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SECTION-10 (i) : FORM OF PERFORMANCE SECURITY - BANK GUARANTEE BOND (BG)

In consideration of the DIRECTOR-ICTS having agreed under the terms and conditions of Letter of Intene / Agreement No……. dated…….. made between …….....……and …….....……. (hereinafter called " the said Contractor{s}") .for the work …..... .....…… (hereinafter called " the said Letter of Intent / Agreement") having agreed to production of a irrevocable bank Guarantee for Rs. ……. (Rupees …….. only), as a security / guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement, we ……..…….....(Indicate the name of the Bank) (hereinafter referred to as "the Bank") hereby undertake to pay to the Government an amount not exceeding Rs. ……..... (Rs.....…….only) on demand by the Government.

2. We …….....…….. (indicate the name of Bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Government stating that the amount claimed is required to meet the recoveries due or likely to be due from the said Contractor(s). Any such demand made on the bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs……. (Rupees.....only).

3. We, the said bank, further undertake to pay to the Government any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal relating thereto, our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder and the Contractor(s) shall have no claim against us for making such payment.

4. We……. (indicate the name of Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Government under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till Engineer-in-charge on behalf of the Government certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.

5. We ……. (indicate the name of Bank) further agree with the Government that the Government shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Government against the said Contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of the Government or any indulgence by the Government to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

7. We, ……. (indicate the name of Bank) lastly undertake not to revoke this guarantee except with the previous consent of the Government in writing.

8. This guarantee shall be valid up to ……., unless extended on demand. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to Rs. ……..… (Rupees …….....……. only) and unless a claim in writing is lodged with us within six months of the date of expiry or the extended date of expiry of this guarantee, all our liabilities under this guarantee shall stand discharged.

Signed and sealed

Dated the ……..... day of ……..……. for …….....……(indicate the name of Bank)

(Note: **The Letter of Intent shall form part of the Agreement)**

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SECTION 10 (ii) : INDENTURE FOR SECURED ADVANCE

(For use in cases in which the contract is for finished work and the contractor has entered into an agreement for the execution of a certain specified quantity of work in a given time.)

ICTS-TIFR

State :

Administration :

Division :

THIS INDENTURE made the.....day of .....19..... BETWEEN ..... (hereinafter called the Contractor which expression shall where the context so admits or implies be deemed to include his executors, administrators and assigns) of the one part and the DIRECTOR-ICTS (hereinafter called the DIRECTOR-ICTS which expression shall where the context so admits or implies be deemed to include his successors in office and assigns) of the other part.

WHEREAS by an agreement dated .....

(hereinafter called the said agreement) the contractor has agreed.

AND WHEREAS the contractor has applied to the DIRECTOR-ICTS that he may be allowed advance on the security of materials absolutely belonging to him and brought by him to the site of the works, he subject of the said agreement for use in the construction of such of the works as he has undertaken to execute at rates fixed for the finished work (inclusive of the cost of materials and labour and other charges).

AND WHEREAS the DIRECTOR-ICTS has agreed to advance to the contractor the sum of Rs ....on the security of materials, the quantities and other particulars of which are detailed in Part-II of a Running Account Bill (B) for the said works signed by the contractor on ..... and the DIRECTOR-ICTS has reserved to himself the option of making any further advances on the security of other materials brought by the contractor to the site of the said works.

NOW THIS INDENTURE WITNESSETH that in pursuance of the said agreement and in consideration of the sum of Rs. ..... on or before the execution of these presents paid to the contractor by the DIRECTOR-ICTS (the receipt where of the contractor both hereby acknowledge and of such further advance, if any, as may be made to him as aforesaid the contractor both hereby convenent and agree with the DIRECTOR-ICTS and declare as follows:

1. That the said sum of Rupees .....so advanced by the DIRECTOR-ICTS to the contractor as aforesaid and all or any further sum or sums advanced as aforesaid shall be employed by the contractor in or towards expenditure the execution of the said works and for no other purpose whatsoever.

2. That the materials detailed in the said Running Account Bill (B) which have been offered to and accepted by the DIRECTOR-ICTS as security are absolutely the contractor's own property and free from encumbrances of any kind and the contractor will not make any application for or receives a further advance on the security of materials which are not absolutely his own property and free from encumbrance of any kind and the contractor indemnifies and DIRECTOR-ICTS against all claims to any materials in respect of which an advance has been made to him as aforesaid.

3. That the materials detailed in the said Running Account Bill (B) and all other materials on the security of which any further advance or advances may hereafter to be made as aforesaid (hereinafter called the said materials) shall be used by the contractor solely in the execution of the said works in accordance with the directions of the Divisional Officer of the said works, Civil Engineering Division (hereinafter called "the Divisional Officer) and in the terms of the said agreement.

4. That the contractor shall make at his own cost all necessary and adequate arrangements for the proper watch, safe-custody and protections against all risks of the said materials and that until used in construction as aforesaid said materials shall remain at the site of the said works in the contractor's custody and on his own responsibility and shall at all times be open to inspection by the Divisional Officer or any officer authorised by him. In the event of the materials or any part thereof being stolen, destroyed or damaged or becoming deteriorated in a greater degree that is due to reasonable use and wear thereof the contractor will forthwith replace the same with other materials of like quality or repair and make good the same as required by the Divisional Officer.

5. That the said materials shall not on any account be removed from the site of the works except with the written permission of the Divisional Officer or an officer authorised by him on that behalf.

6. That the advance shall be repayable in full when or before contractor receives payment from the DIRECTOR-ICTS of the price payable to him for the said works under the terms and provisions of the said agreement. Provided that if any intermediate payments are made to the contractor on account of work done thereon the occasion of each such payment the DIRECTOR-ICTS will be at liberty to make a recovery from the

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contractor's bill for such payment by deduction there from the value of the said materials than actually used in the construction and in respect of which recovery has not been made previously the value for this purpose being determined in respect of the each description of materials at the rates at which the amounts of the advances made under these presents were calculated.

7. That if the contractor shall at any time make any default in the performance or observance in any respect of any of the terms and provisions of the said agreement or of these presents the total amount of the advance or advances what may still be owing to the DIRECTOR-ICTS shall immediately on the happening of such default be repayable by the contractor to the DIRECTOR-ICTS together with interest thereon at twelve percent per annum from the date of respective dates of such advance or advances to the date of repayment and with all costs, charges, damages and expenses incurred by the DIRECTOR-ICTS in or for the recovery thereof or the enforcement of this security or otherwise by reasons of the default of the contractor and contractor hereby convenants and agrees with the DIRECTOR-ICTS to repay and pay the same respectively, to him accordingly.

8…That the contractor hereby charges all the said materials with the repayment to the DIRECTOR-ICTS of the said sum of Rs. .....

and any further sum or sums advanced as aforesaid and all costs, charges, damages and expenses payable under these presents PROVIDED ALWAYS and it is hereby agreed and declared that not-withstanding anything in the said agreement and without prejudice to the powers contained therein if and whenever the convenant for Payment and repayment herein before contained shall become enforceable and the money owing shall not be paid in accordance there with the DIRECTOR-ICTS may at any time thereafter adopt all or any of the following courses as he may deemed best.

a) Seize and utilise the said materials or any part thereof in the completion of the said works on behalf of the contractor in accordance with the provisions in that behalf contained in the said agreement debiting the contractor with the actual cost of effecting such completion and the amount due in respect of advances under these present and crediting the contractor with the value of work done as if he had carried it out in accordance with the said agreement and at the rates thereby provided. If the balance is against the contractor he is to pay same to the DIRECTOR-ICTS on demand.

b) Remove and sell by public auction the seized materials or any part thereof and out of the moneys arising from the sale retain all the sum, aforesaid repayable or payable to the DIRECTOR-ICTS under these presents and pay over the surplus (if any) to the contractor.

c) Deduct all or any part of the money owing out of the security deposit or any sum due to the contractor under the said agreement.

9. That except in the event of such default on the part of the contractor as aforesaid interest on the said advances shall not be payable.

10. That in the event of any conflict between the provisions of these presents and the said agreement the provisions of these presents shall prevail and the event of any dispute or difference arising over the construction or effect of these presents the settlement of which has not been herein before expressly provided for the same shall be referred to the Project Engineer / Tender Inviting Authority, , time being in force shall apply to any such reference.

IN WITNESS thereof the said.....and .....

by the order under the direction of the DIRECTOR-ICTS have hereinto set their respective hands the day and year first above written.

Signed, sealed and delivered by the said contractor in the presence of :

Signature

Name

Address

Witness

Signed by

by the order and direction of the DIRECTOR-ICTS in the presence of:

Signature

Name

Witness

Address

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I - SPECIFICATIONS FOR CIVILWORKS

GENERAL NOTES :

i) The detailed specifications given hereinafter are for the items of works described in the schedule of quantities attached herein, and shall be guidance for proper execution of work to the required standards.

ii) It may also be noted that the specifications are of generalised nature and these shall be read in conjunction with the description of item in schedule of quantities and drawings. The work also includes all minor details of construction which are obviously and fairly intended and which may not have been referred to in these documents but are essential for the entire completion in accordance with standard Engineering practice.

iii) Unless specifically otherwise mentioned, all the applicable codes and standards published by the Indian Standard Institution and all other standards which may be published by them before the date of receipt of tenders, shall govern in all respects of design, workmanship, quality and properties of materials and methods of testing, method of measurements etc. Wherever any reference to any Indian Standard Specifications occurs in the documents relating to this contract, the same shall be inclusive of all amendments issued their to or revisions thereof, if any, upto the date of receipt of tenders.

iv) In case there is no I.S.I. specification for the particular work, such work shall be carried out in accordance with the instructions in all respects, and requirements of the Engineer-in-Charge. Wherever any reference to any Indian Standard Specification occurs in the documents relating to this contract, the same shall be inclusive of all amendments issued their to or revisions thereof, if any, upto the date of receipt of tenders.

v) The work shall be carried out in a manner complying in all respects with the requirements of relevant bye- laws of the Municipal Committee/Municipal Corporation/Development Authority/Improvement Trust under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-Charge and, unless otherwise mentioned, nothing extra shall be paid on this account.

vi) Samples of various materials, fittings etc. proposed to be incorporated in the work shall be submitted by the contractor for approval of the Engineer-in-charge before order for bulk supply is placed.

vii) The contractor shall take instructions from the Engineer-in-Charge regarding collection and stacking of materials in any place. No excavated earth or building materials shall be stacked on areas where other buildings, roads, services, compound walls etc. are to be constructed.

viii) The contractor shall maintain in perfect condition all works executed till the completion of the entire work awarded to him. Where phased delivery is contemplated, this provision shall apply to each phase.

ix) The contractor shall give a performance test of the entire installation(s) as per standard specifications before the work is finally accepted and nothing extra whatsoever shall be payable to the contractor for the test.

x) The contractor shall clear the site thoroughly of all scaffolding materials and rubbish etc. left out of his work and dress the site around the building to the satisfaction of the Engineer-in-Charge before the work is considered as complete.

xi) **Post construction inspection and testing:** After completion of the work and during maintenance period liability of the contractor, the work shall also be subjected to 'Post construction inspection and testing'. In case the materials or articles incorporated in the work are found to be inferior, though the sample collected for the same might

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have been passed at the time of execution, it shall be the responsibility of the contractor to replace the same at his own cost, failing which the Department may rectify the same at the risk and cost of the contractor or Department may accept the work as sub-standard, and cost be adjusted from the outstanding security deposit, as per the terms and conditions of the contract for the work.

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

xiii) In case any difference or discrepancy between the specifications and the description in the schedule of quantities, the schedule of quantities shall take precedence. In case of any difference or discrepancy between specifications and drawing, the specifications shall take precedence.

1. EARTH WORK

1.1 SCOPE OF WORK :

The scope of work covered under this specifications pertains to excavation of foundations, trenches, pits and over areas, in all sorts of soils, soft and hard rock, correct to dimensions given in the drawing including shoring, protections of existing underground utilities if any, such as water lines, electric cables etc., dewatering and shoring if necessary, stacking the useful materials as directed within the lead specified, refilling around the foundation and into the plinth with selected useful excavated earth and disposing off the surplus earth/materials within specified lead and finishing the surface to proper levels, slopes and camber etc. all complete.

1.2 SITE CLEARANCE :

Before the earth work is started the area coming under cutting and filling shall be cleared of all obstructions, loose stones, shrubs, rank vegetation, grass, brush-wood, trees and saplings of girth upto 30 cm. measured at a height of one metre above ground and rubbish removed upto a distance of 150 metres outside the periphery of the area under clearance. The roots of trees shall be removed to a minimum depth of 60 cm. below ground level, or a minimum of 30cm. below formation level whichever is lower, and the hollows filled up with earth, levelled and rammed. This work is deemed to be included in the earth work items and no separate payment will be admissible for the work.

The trees of girth above 30 cm. measured at a height of one meter above ground, shall only be cut after permission of the Engineer-in-charge is obtained in writing. The roots shall also be removed as described in the preceding sub-para. Payment for cutting and removing roots of such trees shall be made separately. Any material obtained from the site will be the property of the Department and the useful materials as decided by the Engineer-in-charge will be conveyed and properly stacked as directed within the lead specified.

1.3 SETTING OUT AND MAKING PROFILES :

Masonry or concrete pillars will be erected at suitable points in the area to serve as bench marks for the execution of the work. These bench marks shall be connected with G. T. S. or any other permanent bench mark approved by the Engineer-in-charge. Necessary profiles with pegs, bamboos and strings or Burjis shall be made to show the correct formation levels before the work is started. The contractor shall supply labour and materials for setting out and making profiles and Burjis for the work at his own cost and the same shall be maintained during the excavation work. The Department will show grid Co-ordinate or other reference points. It shall be the responsibility of the contractor to set out centre lines correctly with reference to the drawings and install substantial reference marks. Checking of such alignment by the Department will not absolve the contractor from his responsibility to execute the work strictly in accordance with the drawings.

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1.4 EXCAVATION :

The contractor shall notify the Engineer-in-charge before starting excavation and before the ground is disturbed, to enable him to take existing levels for the purpose of measurements. The ground levels shall be taken at 5 to 15 metres intervals in uniformly sloping ground and at closer distance where local mounts, pits or undulations are met with, as directed by the Engineer-in-charge. The ground levels shall be recorded in field books and plotted on plans, which shall be signed by the Contractor and the Engineer-in-charge, before the earth work is actually started. The labour required for taking levels, shall be supplied by the Contractor at his own cost. The Contractor shall perform excavation in all types of soils, murrum, soft and hard rock, boulders etc. in foundation, over areas and in trenches to widths, lines, levels, grades and curves as shown in the drawing or lesser widths, lines and levels as directed by the Engineer-in-charge and as per items in the schedule of quantities.

1.4.1 The item in the schedule of quantities shall specify the excavation in trenches or over areas. For this purpose, the excavation for any depth in trenches for foundation not exceeding 1.5 m. in width or 10 sqm. on plan shall be described as **Excavation in foundation trenches.**

1.4.2 Excavation exceeding 1.5m in width as well as 10 sqm. on plan (excluding trenches for pipes, cables etc.) and exceeding 30 cm in depth shall be described as **Excavation over areas.**

1.4.3 Excavation exceeding 1.5m in width as well as 10 sqm. on plan but not exceeding 30 cm. in depth shall be described as Surface Excavation.

1.5 Classification of Earth Work: The earth work shall be classified under the following main categories and measured separately for each category.

a) All types of soils, murrum, boulders.

b) Soft rock.

c) Hard rock.

1.5.1 a) All types of Soils, Murrum, Boulders : This includes earth, murrum, top deposits of agricultural soil, reclaimed soil, clay, sand or any combination thereof and soft and hard murrum, shingle etc. which is loose enough to be removed with spades, shovel and pick axes. Boulders not more than 0.03 cum. in volume found during the course of excavation shall also fall under this classification.

b) Excavation in Soft Rock : This shall include all materials which are rock or hard conglomerate, all decomposed weathered rock, highly fissured rock, old masonry, boulders bigger than 0.03 cum. in volume but not bigger than 0.5 cum. and other varieties of soft rock which can be removed only with pick axes, crow bars, wedges and hammers with some difficulty. The mere fact that the contractor resorts to blasting and/or wedging and chiselling for reasons of his own, shall not mean the rock is classificable as hard rock.

c) Excavation in Hard Rock : This includes all rock other than soft rock mentioned in para 1.5.1 (b) viz. soft rock, occurring in masses, boulders having approximate volume more than 0.5 cum. plain or reinforced cement concrete, which can best be removed by blasting or chiselling and wedging where blasting cannot be permitted owing to any restriction at site.

i) Excavation in Hard Rock by Blasting : Where blasting is permitted the excavation in rock shall be done by means of blasting. No heavy blasting will be permitted and only controlled/muffled blasting will be permitted at the discretion of the Engineer-in-Charge. The Contractor shall be governed by the relevant statutory laws, rules and regulations on explosives, pertaining to the acquisition, transport, storage, handling and use of explosive which shall be rigidly followed and shall obtain himself all necessary materials and equipment for blasting. Blasting shall be executed through a licensed blaster with prior permission from police authorities. Prior to blasting sufficient notice shall be given to concerned parties to

avoid danger to people, materials and nearby structures. All the damages caused by careless blasting if any shall be made good by the contractor at his own expenses.

ii) Excavation in Hard Rock by Chiselling and Wedging : Where blasting is not permitted and if the Engineer-in-Charge so desires, the excavation shall be done by chiselling and wedging or any other agreed method.

NOTE : All the excavated hard rock obtained shall be stacked properly and neatly within the specified lead by the contractor as directed by the Engineer-in-Charge.

1.6 EXCAVATION PARAMETERS : The excavation under all classifications in areas in trenches or in pits shall be carried out systematically. Cutting shall be done from top to bottom and no under-pining or undercutting will be allowed. The bottom and sides of excavation shall be dressed to proper level, slopes,steps, camber etc. by removing high spots, and ramming thoroughly as directed by the Engineer-in-charge.

All the excavation shall be carried out strictly to the dimensions given in the drawing. The width shall generally be of the width of mudmat concrete and depth as shown in drawing or as directed by the Engineer-in-Charge, according to availability of the desired bearing capacity of soil below. Any excavation if taken below the specified depths and levels, the contractor shall at his own cost fill up such overcut to the specified level with cement concrete 1:4:8 in case of excavation in all types of soils and with cement concrete 1:2:4 in case of excavation in soft and hard rock.

After the excavation is completed, the contractor shall notify the Engineer-in-Charge to that effect and no further work shall be taken up until the Engineer-in-Charge has approved the depth and dimensions and also the nature of foundation materials. Levels and measurements shall also be recorded prior to taking up any further work.

1.7 SHORING :

Unless separately provided for in the schedule of quantities, the quoted rate for excavation shall include excavation of slopes to prevent falling in soil by providing and/or fixing, maintaining and removing of shoring, bracing etc. The contractor would be responsible for the design of shoring for proper retaining of sides of trenches, pits etc. with due consideration to the traffic, superimposed loads etc. Shoring shall be of sufficient strength to resist the pressure and ensure safety from slips and to prevent damage to work and property and injury to persons. It shall be removed as directed after items for which it is required are completed. Should the slips occur, the slipped material shall be removed and slope dressed to a modified stable slope. Removal of the slipped earth will not be measured for payment.

1.8 DEWATERING :

Unless specifically provided for as a separate item in the schedule of quantities, rate shall also include bailing or pumping out all water which may accumulate in the excavation during the progress of further works such as mud mat concrete, R.C. footings, shuttering etc. either due to seepage, springs, rain or any other cause and diverting surface flow by bunds or other means. Care shall be taken to ensure that the water discharged sufficiently away from the foundations to keep it free from nuisance to other works in the neighbourhood.

1.9 DISPOSAL OF EXCAVATED MATERIALS :

a) ANTIQUITES : Any finds of archaeological interest such as relics of antiquity, coins, fossils or other articles of value shall be delivered to the Engineer-in-Charge and shall be the property of the Government.

b) USEFUL MATERIALS : Any material obtained from the excavatiion which in the opinion of the Engineer-in- Charge is useful, shall be stacked separately in regular stacks as directed by the Engineer-in-Charge and shall be the property of the Government.

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No material excavated from foundation trenches of whatever kind they may be are to be placed even temporarily nearer than about 3 m. from the outer edge of excavation. Discretion of the Engineer-in-Charge in such cases is final. All materials excavated will remain the property of the Department. Rate for excavation includes sorting out of the useful materials and stacking them separately as directed within the specific lead.

Materials suitable and useful for backfilling or other use shall be stacked in convenient place but not in such a way as to obstruct free movement of materials, workers and vehicles or encroach on the area required for constructional purposes. It shall be used to the extent required to completely backfill the structure to original ground level or other elevation shown on the plan or as directed by the Engineer-in-Charge. **Materials not useful in anyway shall be disposed off, levelled and compacted as directed by the Engineer-in-charge within a specified lead. The site shall be left clean of all debris and levelled on completion.**

1.10 BACKFILLING IN SIDES OF FOUNDATIONS, PLINTH, UNDER FLOOR ETC. :

The back filling shall be done after the concrete or masonry has fully set and shall be done in such a way as not to cause under-thrust on any part of the structure. Where suitable excavated material is to be used for back filling, it shall be brought from the place where it was temporarily deposited and shall be used in backfilling. The scope of work for back filling/filling in foundation, plinth, under floors etc. shall include filling for all the buildings covered under the contract. Surplus earth available from one building, if required, shall be used for backfilling/filling for other buildings also within the specified lead mentioned in the item.

All timber shoring and form work left in the trenches, pits, floors etc. shall be removed after their necessity ceases and trash of any sort shall be cleared out from the excavation. All the space between foundation masonry or concrete and the sides of excavation shall be backfilled to the original surface with approved materials in layers not exceeding 150 mm. in thickness, watered and well consolidated by means of rammers to atleast 90% of the consolidation obtainable at optimum moisture content (Proctor density). Flooding with water for consolidation will not be allowed. Areas inaccessible to mechanical equipment such as areas adjacent to walls and columns etc. shall be tamped by hand rammer or by hand held power rammers to the required density. The backfill shall be uniform in character and free from large lumps, stones, shingle or boulder not larger than 75 mm. in any direction,salt, clods, organic or other foreign materials which might rot. The backfilling in plinth and under floors shall be done in similar way in layers not exceeding 150 mm. thick and shall be well consolidated by means of mechanical or hand operated rammers as specified to achieve the required density.

Test to establish proper consolidation as required will be carried out by the Department at rates specified. Two tests per 50 sqm. will be taken to ascertain the proper consolidation. The cost of tests carried out will be recovered from the contractors bill.

1.11 FILLING IN PLINTH AND UNDER FLOORS:

After the available suitable excavated materials are exhausted as backfilling, the contractor shall notify the Engineer-in-Charge, of the fact and levels taken jointly with Engineer-in-Charge. The earth, murrum, sand, gravel etc. or such materials suitable for filling proposed to be filled under floors and so mentioned in the item of schedule of quantities shall then be brought to site from approved locations and sources.

i) Earth Filling : The earth, soft murrum etc. so brought shall be filled up in layers of 15 cm depth, each layer being well watered and consolidated by approved hand or mechanical tampers or other suitable means to achieve the required density.

ii) Gravel or Sand Filling : Gravel if required to be filled under floors, shall be single washed gravel of approved quality and of size varying from 12 mm. to 20 mm. it shall be uniformly blinded with approved type of soil and/or sand to obtain full compaction. Gravel shall be filled in specified thickness and shall be well watered and rammed entirely to the

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satisfaction of the Engineer-in-Charge.

If sand is required to be filled under floors,it shall be clean, medium grained and free from impurities. The filled in sand shall be kept flooded with water for 24 hrs. to ensure maximum consolidation. Any temporary work required to maintain sand under flooded condition shall be done by the contractor at his own cost. The surface shall then be well dressed and got approved from Engineer-in-Charge before any other work is taken over the fill.

1.12 LEAD & LIFT

LEAD : The lead for disposal/deposition of excavated materials shall be as specified in the respective item of work. For the purpose of measurements of lead, **the area to be excavated or filled or area on which excavated material is to be deposited/disposed off shall be divided in suitable blocks and for each of the block, the distance between centre lines shall be taken as the lead which shall be measured by the shortest straight line route on the plan and not the actual route adopted.**

LIFT : Lift shall be measured from ground level. Excavation up to 1.5 m depth below ground level and depositing excavated material on the ground shall be included in the item of earthwork for various kinds of soil. Extra lift shall be measured in unit of 1.5 m or part thereof. Obvious lift shall only be measured; that is lifts inherent in the lead due to ground slope shall not be measured except for lead upto 250 m. All excavation shall be measured in successive stages of 1.5 m stating the commencing level. This shall not apply to cases where no lift is involved as in hill side cutting.

1.13 MODE OF MEASUREMENTS:

1.13.1 All excavation in areas having depth more than 30 cm. pits, trenches etc. shall be measured net. The dimensions for the purpose of payment shall be reckoned on the horizontal area of the excavation at the base for foundations of the walls, columns, footings, rafts or other foundations, multiplied by the mean depth from the surface of ground determined by levels. Excavation for side slopes will not be paid for. Excavation in areas having depths less than 30 cms. shall be measured as surface excavation on square metre basis,mentioning the average depth of excavation.

Reasonable working space beyond concrete dimensions shall be allowed for waterproofing and shuttering works in underground water tanks, sumps, septic tanks etc., where considered necessary in the opinion of the Engineer-in- Charge. However the same shall be limited to the following:

i) Waterproofing and shuttering works upto 2M	Maximum upto 600mm from wall face or 300mm from the edge of offset / raft, whichever is more.
ii) Waterproofing and shuttering works beyond 2M depth	Maximum upto 900mm from wall face or 300mm from the edge of offset / raft, whichever is more.

Reasonable working space beyond concrete dimension required for waterproofing and shuttering where considered necessary in the opinion of Engineer-in Charge will be allowed in execution and considered for payment for underground water tank, sump, septic tank etc.

1.13.2 Wherever direct measurements of rock excavation are not possible, volume of rock be calculated on the basis of length, breadth and depth of stacks made at site as mentioned in

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para 1.5.1 (c). The net volume shall be worked out by reducing it by 50%, taking the voids into consideration as 50%. Similarly to arrive at net quantity to be paid in the case of soil, reduction @ 20% of corresponding stack/truck measurements shall be made.

1.13.3 **The rate for excavation shall include carting and disposing and levelling the excavated materials within the specified lead.** The rate shall also be inclusive of cost of all tools, plants, explosives, shoring, dewatering at various stages, labour, materials etc. to complete all the operations specified.

1.13.4 The backfilling and consolidation in sides of foundation and in plinth with excavated material will not be paid for separately. The rate quoted for excavation shall be deemed to have been included the cost of stacking of excavated materials, conveying within the specified lead, picking of selected stacked materials, conveying it to the place of final backfill, compaction to the required proctor density etc.

1.13.5 Payment for filling and consolidation inside the trenches, sides of foundations, plinth etc. with selected materials brought by the contractor other than the excavated material, shall be paid for separately as per the rates in schedule of quantities which includes cost of such materials/excavation, royalty, its conveyance within the specified lead, watering, consolidating, dressing etc. Actual quantity of consolidated filling shall be measured and paid in cubic metres upto two places of decimal.

1.13.6 The rate quoted in cum. for items of excavation is deemed to include the necessary additional quantity of excavation involved beyond the plan dimensions of the work which may be necessary to be carried out for carrying out the work in an engineering manner, decided upon by the contractor. Therefore no extra payment will be made for any excavation done other than the required quantity as per the plan dimension indicated in the drawings.

1.13.7 Measurements for excavation over areas shall be determined by levels or by “Dead men” or both at the discretion of the Engineer-in-Charge. If however the Engineer-in-Charge decides on measurement by levels, levels of site shall be jointly taken and recorded by the Engineer-in-Charge or his representatives and the contractor, before commencement of the work and after completion of the work and the quantity of work done shall be computed based on these levels. The volume of earth work shall be computed based on “Simpsons formula” or any other approved method at the discretion of the Engineer-in-Charge.

2. 0 PLAIN / REINFORCED CONCRETE AND ALLIED WORKS:

2.1 SCOPE :

Scope of the specification deals with the structural and general use of plain and reinforced cement concrete.. The specifications cover the qualitative and quantitative requirements in respect of selection of ingredients, proportioning, manufacture of concrete, transport, placing, consolidation, curing, finishing, acceptance criteria etc., These specifications also cover the requirement of form work and reinforcement.

2.2. Unless otherwise specified, the manufacture and placing of concrete shall be done by weigh batching. However, in the specific cases where mechanized batching system (Ready mix concrete), mechanical transport and pumping is specified the same shall be followed as per the terms of the contract.

2.3 CEMENT CONCRETE (PLAIN AND REINFORCED):

2.3.1 The quality of materials and method and control of manufacture and transportation of all concrete work in respect of mix, whether reinforced or otherwise, shall conform to the applicable portions of these specifications.

2.3.2 Mandatory tests: The Engineer-in-Charge shall have the right to inspect the sources of materials, the layout and operation of procurement and storage of materials, the

concrete batching and mixing equipments and the quality control system. The contractor shall arrange such an inspection and the Engineer-in-Charge approval shall be obtained prior to starting the concrete work. List of mandatory test for RCC to be carried out is enclosed as Annexure "A".

2.3.3 Materials for Standard Concrete : The ingredients to be used in the manufacture of standard concrete shall consist solely of a standard type Portland/Portland puzzolana cement, clean sand, natural coarse aggregate, clean water, ice and admixtures if specially called for on drawings or schedule of quantities.

2.3.3.1. Cement: Unless otherwise specified or called for in the contract specifications, cement shall be any of the following and the type selected should be appropriate for the intended use and as per the contract conditions , specifications and drawings.

a) 33 Grade Ordinary Portland cement conforming

to IS 269 b) 43 Grade ordinary Portland cement

conforming to IS 8112

c) 53 Grade ordinary Portland Cement conforming to IS 12269

d) Portland slag cement conforming to IS 455.

e) Porland pozzolana cement (fly ash based) conforming to IS 1489 (Part I)

f) *Portland pozzolona cement (calcined clay based* conforming to IS 1489 (Part 2)

g) Sulphate resisting Portland cement conforming to IS 12330.

In case the job requires specific use of any of the following cements the same shall be used with the prior approval of the EIC and necessary precautions with regard to their setting and hardening time, time required for de-shuttering, curing etc., shall be taken after carefully complying with specific literature with regard to those types.

1.High Alumina cement - conforming to IS 6452

2.Low heat cement - conforming to IS 12600

3.Super sulphate cement - conforming to IS 6909

4.Rapid Hardening cement - conforming to IS 8041

5. Blended Cement for finishing work as below

Other combinations of Portland Cement with mineral admixtures of quality conforming to relevant Indian Standards laid down may also be used in the manufacture of concrete provided that there are satisfactory data on their suitability, such as performance test on concrete containing them and only in such case where in specifically called for in the contract.

2.3.3.1 (A). ***Mineral Admixtures***

Pozzolana: Pozzolanic materials conforming to relevant Indian Standards may be used with the permission of
Engineer-in-charge, provided uniform blending with cement is ensured.

Fly ash (pulverized fuel ash): Fly ash conforming to Grade 1 of IS 3812 may be used as part replacement of ordinary Portland cement provided uniform blending with cement is ensured.

Silica fume: Silica fume conforming to a standard approved by the deciding authority can be used as part replacement of cement provided uniform blending with the cement is ensured.

Note: The silica fume (very fine non –crystalline silicon dioxide)is a by-product of the manufacture of silicon, ferrosilicon or the like, from quartz and carbon in electric arc furnace. It is usually used in proportion of 5 to 10 percent of the cement content of a mix.

Rice husk ash: Rice husk ash giving required performance and uniformity characteristics may be used with the approval of the deciding authority.

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Note: Rice husk ash is produced by burning rice husk and contain large proportion of silica. To achieve amorphous state, rice husk may be burnt at controlled temperature. It is necessary to evaluate the product from a particular source for performance and uniformity since it can range from being as deleterious as silt when incorporated in concrete. Water demand and drying shrinkage should be studied before using rice husk.

Metakaoline: Metakaoline having fineness between 700 to 900m2/kg may be used as pozzolanic material in concrete.

Note: Metakaoline is obtained by calcination of pure or refined kaolintic clay at a temperature between 650^{0}C and 850^{0}C, followed by grinding to achieve a fineness of 700 to 900 m2/kg. The resulting material has high pozzolanicity.

Ground Granulated Blast Furnace Slag: Ground granulated blast Furnace slag obtained by grinding granulated blast furnace slag conforming to IS 12089 may be used as part replacement of ordinary Portland cement provided uniform blending with cement is assured.

A certified report attesting to the conformity of the cement to I.S. specifications by the cement manufacturers chemist shall be furnished to the Engineer-in-Charge, if demanded. The Contractor, shall make his own arrangements for the storage of adequate quantity of cement at no extra cost at the site of work as per instructions and approval of the Engineer-in-Charge.

Specification for Storage:

Cement in bags shall be stored and stacked in a shed, which is dry, leak-proof and moisture proof as far as possible. Storage under tarpaulins will not be permitted. Flooring of the shed shall consists of the two layers of dry bricks laid on well consolidated earth to avoid contact of cement bags with the floor. Stacking shall be done about
150 to 200 mm clear above the floor using wooden planks. Cement bags shall be stacked at least 450 mm clear off the walls and in rows of two bags leaving in a space of at least 600 mm between two consecutive rows. In each row the cement bags shall be kept closed together so as to reduce air circulation. Stacking shall not be more than ten bags high to avoid lumping under pressure. In stacks more than eight bags high, the cement bags shall be arranged in header and stretcher fashion i.e alternately lengthwise and crosswise so as to tie the stacks together and minimize the danger of toppling over.

Damaged or reclaimed or partly set cement will not be permitted to be used and shall be removed from the site. The storage arrangements shall be such that there is no dead storage consignments in cement shall be stored as received and shall be consumed in the order of their delivery.

Cement held in store for a period of ninety (90) days or longer shall be retested before use in work. Should at any time the Engineer-in-Charge have reasons to consider that any cement is defective, then irrespective of its origin and/or manufacturers test certificate, such cement shall be tested immediately at a National Test Laboratory/Departmental Laboratory or such approved laboratory, and until the results of such tests are found satisfactory, it shall not be used in any work.

2.3.3.2 Aggregates :

a) **"Aggregate"** in general designates both fine and coarse inert materials used in the manufacture of concrete.

b) **"Fine Aggregate"** is aggregate most of which passes through 4.75 mm I.S. sieve.

c) **"Coarse Aggregate"** is aggregate most of which is retained on 4.75 mm I.S. sieve.

Aggregate shall comply with requirement of IS 383. As far as possible preference shall be given to machine broken and graded aggregate.

All fine and coarse aggregates proposed for use in the work shall be subject to the Engineer-in-Charge's approval and after specific materials have been accepted, the source of supply of such materials shall not be changed without prior approval of the Engineer-in-Charge.

Aggregate shall, except as noted above, consists of natural sand, crushed stone and gravel from a source known to produce satisfactory aggregate for concrete and shall be chemically inert, strong, hard, durable against weathering, of limited porosity and free from deleterious materials that may cause corrosion to the reinforcement or may impair the strength and/or durability of concrete. The grading of aggregates shall be such as to produce a dense concrete of specified strength and consistency that will work readily into position without segregation and shall be based on the "mix design" and preliminary test on concrete specified herein-after.

Sampling and testing : Sampling of the aggregates for mix design and determination of suitability shall be taken under the supervision of the Engineer-in-Charge and delivered to the laboratory, well in advance of the schedule for placing of concrete. Records of tests which have been made on proposed aggregates and on concrete made from this source of aggregates shall be furnished to the Engineer-in-Charge in advance of the work for use, in determining suitability of the proposed aggregate.

Storage of aggregates : All coarse and fine aggregates shall be stacked separately in stock piles in the material yard near the work site in bins properly constructed to avoid inter mixing of different aggregates. Contamination with foreign materials and earth during storage and while heaping the materials shall be avoided. The aggregate must be of specified quality not only at the time of receiving at site but also at the time of loading into mixer. Rakers shall be used for lifting the coarse aggregate from bins or stock piles. Coarse aggregate shall be piled in layers not exceeding 1.00 metres in height to prevent conning or segregation. Each layer shall cover the entire area of the stock pile before succeeding layers are started. Aggregates that have become segregated shall be rejected. Rejected material after re- mixing may be accepted, if subsequent tests demonstrate conformity with required gradation.

Specific Gravity : Aggregates having a specific gravity below 2.6 (saturated surface dry basis) shall not be used without special permission of the Engineer-in-Charge.

2.3.3.2.1 Fine Aggregate: Fine aggregate except as noted above, and for other than light weight concrete shall consist of natural or crushed sand conforming to I.S. 383. The sand shall be clean, sharp, hard, strong and durable and shall be free from dust, vegetable substances, adherent coating, clay, loam, alkali, organic matter, mica, salt or other deleterious substances which can be injurious to the setting qualities/strength/durability of concrete.

2.3.3.2.2 Machine Made Sand : Machine made sand will be acceptable, provided the constituent rock composition is sound, hard, dense, non-organic, uncoated and durable against weathering. Machine made sand shall be accepted provided grading & finer particle limits conform to IS 383.

2.3.3.2.3 Screening and Washing : Sand shall be prepared for use by such screening or washing or both, as necessary, to remove all objectionable foreign matter while separating the sand grains to the required size fractions. Sand with silt content more than 3 percent will not be permitted to be used unless the same is washed and silt content is brought within 3% by weight.

Foreign Material Limitations : The percentages of deleterious substances in sand, delivered to the mixer shall not exceed the following:

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Sl.No	Substances	*Percent by weight*	
		Uncrushed	**Crushed**
i)	Material finer than 75 micron	3.00	15.00
ii)	Shale	1.00	--
iii)	Coal and lignite	1.00	1.00
iv)	Clay lumps	1.00	1.00
v)	Total of all above substances including items (i) to (iv) for uncrushed sand and items (iii) and (iv) for crushed sand.	5.00	2.00

GRADATION : Unless otherwise directed or approved, the grading of sand shall be within the limits indicated hereunder.

I.S. Sieve Designati	Percentage passing for			
	Grading Zone -I	Grading Zone -II	Grading Zone -III	Grading Zone -IV
9.5	100	10	100	100
4.75m	90-100	90-100	90-100	95-100
2.36m	60-95	75-100	85-100	95-100
1.18	30-70	55-90	75-100	90-100
600	15-34	35-59	60-79	80-100
300	5-	8-	8-	20-65
150	0-	0-	0-	0-15

Where the grading falls outside the limits of any particular grading zone of sieves, other than 600 micron (I.S.) sieve by not more than 5%, it shall be regarded as falling within that grading zone. This tolerance shall not be applied to percentage passing the 600 micron (I.S.) sieve or to percentage passing any other sieve size on the coarser limit of grading zone I or the finer limit of grading zone IV. Fine aggregates conforming to Grading Zone IV shall not be used unless mix designs and preliminary tests have shown its suitability for producing concrete of specified strength and workability.

Fineness Modulus : The sand shall have a fineness modulus of not less than 2.2 or more than 3.2. The fineness modulus is determined by adding the cumulative percentages retained on the following I.S. sieve sizes (4.75 mm, 2.36 mm, 1.18 mm, 600 micron, 300 micron and 150 micron) and dividing the sum by 100.

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2.3.3.2.2 Coarse Aggregate : Coarse aggregate for concrete, except as noted above and for other than light weight concrete shall conform to I.S. 383. This shall consist of natural or crushed stone and gravel, and shall be clean and free from elongated, flaky or laminated pieces, adhering coatings, clay lumps, coal residue, clinkers, sag, alkali, mica, organic matter or other deleterious matter.

The coarse aggregate and fine aggregate shall be tested from time to time as required by the Engineer-in- Charge to ascertain its suitability for use in construction and the charges for testing aggregate shall be born by the contractor as specified herein after.

Screening and Washing : Crushed rock shall be screened and/or washed for the removal of dirt or dust coating, if so demanded by Engineer-in-Charge.

Grading : Coarse aggregates shall be either in single or graded, in both the cases. The grading shall be within the following limits:

I.S. Sieve	Percentage passing for single sized aggregates of nominal						Percentage passing for graded aggregates of			
Designation	63	40	20	16mm	12	10 mm	40 mm	20 mm	16	12.5
75 mm	100	-	-	-	-	-	-	-	-	-
53 mm	85-	100	-	-	-	-	100	-	-	-
37.5 mm	0-30	85-	100	-	-	-	95-100	100	-	-
19 mm	0-5	0-20	85-	100	-	-	30-70	95-	100	100
13.2 mm	-	-	-	85-	100	-	-	-	90-	-
11.2	-	-	-	-	85-100	100	-	-	-	90-
9.5 mm	-	0-5	0-20	0-30	0-45	85-	10-35	25-55	30-70	40-85
4.75 mm	-	0-5	0-5	0-10	0-20	0-20	0-5	0-10	0-10	0-10
2.36	-	-	-	-	0-5	0-5	-	-	-	-

The pieces shall be angular in shape and shall have granular or crystalline surfaces. Friable, flaky and laminated pieces, mica and shale, if present, shall be only in such quantities that will not, in the opinion of Engineer-in-Charge, affect adversely the strength and/or durability of concrete, the maximum size of coarse aggregate shall be the maximum size specified above, but in no case greater than 1/4 of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and fill the corners of form. Plums above 160 mm. and upto any reasonable size can be used in plain mass concrete work of large dimensions upto a maximum limit of 20% by volume of concrete when specifically approved by Engineer-in-Charge. For heavily reinforced concrete members, the nominal maximum size of the aggregate shall be 5 mm. less than the minimum clear distance between the reinforcing main bars or 5mm less than the minimum cover to the reinforcement whichever is smaller. The amount of fine particles occurring in the Free State or as loose adherent shall not exceed
1% when determined by laboratory sedimentation tests as per I.S. 2386. After 24 hours immersion in water, a previously dried sample shall not have gained more than 10% of its oven dry weight in air, as determined by I.S.2386.

Foreign Material Limitations: The percentages of deleterious substances in the coarse aggregate delivered to the mixer shall not exceed the following :

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Sl.No.	Substanc	Percentage by weight of	
		Uncrushed	Crushed
i)	Material finer than 75 micron I.S. Sieve	3.0	3.00
ii)	Coal and lignite	1.0	1.00
iii)	Clay lumps	1.0	1.00
iv)	Soft fragments	3.0	--
v)	Total of all the above substances	5.0	5.00

2.3.3.3 WATER :

Water used for both mixing and curing shall be clean and free from injurious amounts of deleterious materials.viz oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. Potable waters are generally satisfactory for mixing and curing concrete. In case of doubt, the suitability of water for making concrete shall be ascertained by the compressive strength and initial setting time test specified in I.S. 456 - 2000. The sample of water taken for testing shall be typical of the water proposed to be used for concreting, due account being paid to seasonal variation. The samples shall not receive any treatment before testing other than that envisaged in the regular supply of water proposed for use in concrete. The sample shall be stored in a clean container previously rinsed out with similar water.

Average 28 days compressive strength of at least three 150 mm. concrete cubes prepared with water proposed to be used shall not be less than 90% of the average strength of three similar concrete cubes prepared with distilled water as per IS - 516.

The initial setting time of test block made with the appropriate cement and the water proposed to be used shall not be less than 30 minutes and shall not differ by more than (+/-) 30 minutes from the initial setting time of control test block prepared with the same cement and distilled water. The test blocks shall be prepared and tested in accordance with the requirements of I.S. 4031(Part 5).

Where water can be shown to contain an excess of acid, alkali, sugar or salt, Engineer-in-Charge may refuse to permit its use. As a guide, the following concentrations represent the maximum permissible values:

a) Limits of acidity : To neutralize 100 ml sample of water, using phenolphthalein as an indicator, it should not require more than 5 ml. of 0.02 normal NaOH. The details of test shall be as per I.S. 3025 (Part 22)

b) Limits of alkalinity : To neutralize 100 ml sample of water, using mixed indicator , it should not require more than 25 ml. of 0.02 normal H_2SO_4. The details of test shall be as per I.S. 3025 (Part 23).

c) Permissible limits for solids shall be as under (water):

Sl.No	Type of solid	Tested as per	Permissible limit (Max.)
i)	Organic	IS 3025 (Part	200 mg / l
ii)	Inorganic	IS 3025 (Part	3000 mg / l
Iii)	Sulphates (as	IS 3025 (Part	400 mg / l
iv)	Chlorides (asCl)	IS 3025 (Part 32)	2000 mg / l for concrete not containing embedded steel and 500 mg/l for reinforced cement concrete
v)	Suspended	IS 3025 (Part	2000mg / l

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d) The PH value of water shall be not less than

2.4 DESIGN MIX CONCRETE :

All reinforced concrete in the works shall be “Design Mix Concrete” as defined in I.S. 456-2000.

2.4.1Mix Design : This is to investigate the grading of aggregates, water cement ratio, workability and the quantity of cement required to give works cubes of the characteristic strength specified. The proportions of the mix shall be determined by weight. Adjustment of aggregate proportions due to moisture present in the aggregate shall be made. Mix proportioning shall be carried out according to the ACI standard designation ACI- 613or Design of concrete mixes - Road research Note No.4, Department of Scientific and Industrial Research U.K. or I.S. 10262 - 1982.

After award of the work, if so desired by the contractor, he/they may be allowed by the Engineer-in-Charge, till the designed mix is obtained, to carry out the reinforced concrete work in foundation and plinth as per equivalent nominal mix against the specified design mix concrete as per I.S. Codes. However, all other specification for design mix shall govern for nominal mix also and nothing extra shall be paid for use of extra cement or else on this account whether the cement is supplied by the Department or procured by the contractor. Where the quantity of RCC is very small, under such circumstance equivalent nominal mix can also be permitted by the Engineer-in-Charge.

GRADES OF CONCRETE : The concrete shall be in grades designated as below.

Group	***Grade Designation***	***Specified Characteristic compressive strength of***
Ordinary concrete	M 10	1
	M 15	1
	M 20	2
Standard Concrete	M 25	2
	M 30	3
	M 35	3
	M 40	4
	M 45	4
	M 50	5
	M 55	5
High strength concrete	M 60	6
	M 65	6
	M 70	7
	M 75	7
	M 80	8

NOTE : 1. The characteristic strength is defined as the strength of material below which not more than 5% of the test results are expected to fall.

2: In the designation of a concrete mix, letter "M" refers to the mix and the number to the specified characteristic compressive strength of 150 mm. size cubes at 28 days expressed in N/ mm^2.

3. Minimum Cement Content, Maximum Water Cement Ratio and Minimum Grade of Concrete for Different
Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum size.

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Sl No.	Exposure	Plain concrete			Reinforced concrete		
		Minimum cement content Kg/m^3	Maximum Free Water Cement Ratio	Minimum grade of concrete	Minimum Cement Content Kg/m^3	Maximum Free Water Cement Ratio	Minimum Grade of concrete
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Mil	220	0.6	-	300	0.5	M-
ii)	Moderate	240	0.6	M-15	300	0.5	M-
iii)	Severe	250	0.5	M-20	320	0.4	M-
iv)	Very	260	0.4	M-20	340	0.4	M-
v)	***Extreme***	280	0.4	M-25	360	0.4	M-

NOTE:

1. Cement content prescribed in this table is irrespective of the grades of cement and it is inclusive of additions mentioned in mineral admixtures. The additions such as fly ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS 1489 (Part 1) and IS 455 respectively.

2. Minimum grade for plain concrete under mild exposure condition is not specified.

Nominal cover to meet Durability Requirements

Exposure	Nominal concrete cover in mm not less
Mild	20
Moderate	30
Severe	45
Very severe	50
Extreme	75

NOTES

1. For main reinforcement up to 12 mm diameter bar for mild exposure the nominal cover may be reduced by 5 mm.

2. Unless specified otherwise, actual concrete cover should not deviate from the required nominal cover by +
10 mm

3. For exposure conditions 'severe' and ' very severe' , reduction of 5 mm may be made, where concrete grade is M 35 and above.

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Nominal cover to meet specified period of fire resistance

Fire resis - -tance	Nominal						
	BEAMS		SLABS		RIBS		COLUMNS
	Simply Supported	Continuous	Simply Supported	Continuous	Simply Supported	Continuous	
H	mm	mm	m	m	mm	m	mm
0.5	20	2	20	20	20	2	40
1	20	2	20	20	20	2	40
1.5	20	2	25	20	35	2	40
2	40	3	35	25	45	3	40
3	60	4	45	35	55	4	40
4	70	5	55	45	65	5	40

NOTES

1 The nominal covers given relate specifically to the minimum member dimensions as per drawing

2 Cases that lie below the bold line require attention to the additional measures necessary to reduce the risks of spalling.

Adjustments to Minimum cement contents for Aggregates other than 20 mm Nominal Maximum size:

Sl.No	Nominal maximum Aggregate size mm	Adjustments to Minimum cement
(1)	(2)	(3)
i)	10	+4
ii)	20	0
iii)	40	-30

For concrete of compressive strength greater than M55 design parameters given in the standard may not be applicable and the values may be obtained from specialized Literatures and experimental results.

The mix shall be designed to produce the grade of concrete having the required workability and characteristic strength not less than appropriate values given in the table above.

DEGREE OF CONTROL:

Selection of Water Cement Ratio : Since different cements and aggregates of different maximum size, grading, surface texture, shape and other characteristics may produce concretes of different compressive strength for the same free water cement ratio, the relationship between strength and free water-cement ratio should preferably be established for the materials actually to be used. In the absence of such data, the preliminary free water-cement ratio (by mass) corresponding to the target strength at 28 days may be selected from the relationship shown in Fig.1 of I.S.
10262 .

Alternately, the preliminary free water cement ratio (by mass) corresponding to the target average strength may be selected from the relationship in Fig.2- I.S. 10262, using the curve corresponding to the 28 days cement strength to be used for the purpose.

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Other relevant items to be used with design of mix should strictly conform to the relevant clauses and appendices of I.S. 10262 .

The calculated mix proportions shall be checked by means of trial batches as per IS 10262

The free water cement ratio selected as above, should be checked against the limiting water cement ratio for the requirement of durability and the lower of the two values should be adopted.

Whenever there is a change either in required strength of concrete or water cement ratio or workability or the source of aggregates and/or cement, fresh tests shall be carried out to determine the revised proportion of the mix to suit the altered conditions. While designing mix proportions, over wet mixes shall always be avoided.

While fixing the value for water cement ratio for Design Mix assistance may be derived from the standard graph showing the relationship between the 28 days compressive strength of concrete mixes with different water-cement ratios and the 7 days compressive strength of cement tested in accordance with I.S.269.

It will be contractors sole responsibility to establish the concrete mix designs for different grades of concrete specified in the work consistent with the workability required for nature of work and also taking into consideration the assumed standard deviation which will be expected at site or by establishing the standard deviation based on 30 test results at site for each grade of concrete so as to produce concrete of required strength, durability and surface finish. The materials and proportions used in making the tests to be carried out either at site or under laboratory, conditions shall be similar in all respects to those to be actually employed in the works, as the object of these tests is to determine the proportions of cement, aggregates and water necessary to produce the concrete of the required consistency to give such specified strength.

2.4.2: STANDARD DEVIATION:

The standard Deviation for each grade of concrete shall be calculated separately.

STANDARD DEVIATION BASED ON TEST RESULTS :

a) Number of test results - The total number of test results required to constitute and acceptable record for calculation of standard deviation shall be not less than 30. Attempts should be made to obtain the 30 test results, as early as possible, when a mix is used for the first time.

b) Standard deviation to be brought up to date - The calculation of the standard deviation shall be brought upto date after every change of mix design and at least once a month.

Determination of standard deviation :

i) Concrete of each grade shall be analysed separately to determine its standard deviation.

The standard deviation of concrete of a given grade shall be calculated using the following formula from the results of individual tests of concrete of that grade obtained as specified for test strength of sample:

ii) Estimated standard ***deviation*** $\left\{ S = \sqrt{\Sigma \Delta^2 \div (n-1)} \right\}$

iii) Where Δ = Deviation of the individual test strength from the average strength of a sample and n = Number of sample test results.

iii) When significant changes are made in the production of concrete (for example

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changes in the materials used, mix design, equipments or technical control), the standard deviation value shall be separately calculated for such batches of concrete.

Assumed Standard Deviation:

Where sufficient test results for a particular grade of concrete are not available, the value of standard deviation given in table below may be assumed for design of mix in the first instance. As soon as the results of samples are available, actual calculated standard deviation shall be used and the mix designed properly. However, when adequate past records for a similar grade exist and justify to the designer a value of standard deviation different from that shown in table below, it shall be permissible to use that value.

Grade of Concrete	**Assumed Standard Deviation N/ mm^2**
M 10 M 15	3.5
M 20 M25	4.0
M30 M35 M40 M45 M50	5.0

Note: The above values correspond to the site control having proper storage of cement: weigh batching of all materials: controlled addition of water: regular checking of all materials: aggregate gradings and moisture contents : and periodical checking of workability: and strength. Where there is deviation from the above the values given in the above table shall be increased by 1 N / mm.^{2}

2.4.3 Proportioning, Consistency, Batching and Mixing of Concrete:

2.4.3.1 Proportioning :

Aggregate : The proportions which shall be decided by conducting preliminary tests shall be by weight. These proportions of cement, fine and coarse aggregates shall be maintained during subsequent concrete batching by means of weigh batchers conforming to I.S. 2722, capable of controlling the weights within one percent of the desired value. Except where it can be shown to the satisfaction of the Engineer-in-Charge that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions. The different sizes shall be stacked in separate stock piles. The gradings of coarse and fine aggregates shall be checked as frequently as possible, as determined by the Engineer-in-Charge, to ensure maintaining of grading in accordance with samples used in preliminary mix design. The materials shall be stock piled well in advance of use.

Cement : The cement shall be measured by weight. Every facility should be provided to the Engineer-in-Charge for sampling and inspection of stored cement at site of work.

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General environment:

Exposure conditions:

S.No:	Environment	Exposure
(1)	(2)	(3)
i)	Mild	Concrete surfaces protected against weather or aggressive conditions, except those situated in coastal area.
ii)	Moderate	Concrete surfaces sheltered from severe rain or freezing whilst wet Concrete exposed to condensation and rain Concrete continuously under water Concrete in contact or buried under non-aggressive soil/ground water Concrete surfaces sheltered from saturated salt air in coastal area
iii)	Severe	Concrete surfaces exposed to severe rain, alternate wetting and drying or occasional freezing whilst wet or severe condensation. Concrete completely immersed in sea water Concrete exposed to coastal environment.
iv)	Very severe	Concrete surfaces exposed to seawater spray, corrosive fumes or severe freezing conditions whilst wet. Concrete in contact with or buried under aggressive sub-soil/ground water .
v)	Extreme	Surface of members in tidal zone Members in direct contact with liquid/solid aggressive chemicals.

WATER : Only such quantity of water shall be added to the cement and aggregate in the concrete mix as to ensure dense concrete, specified surface finish, satisfactory workability, consistent with strength stipulated for each class of concrete. The water added to the mix shall be such as not to cause segregation of materials or the collection of excessive free water on the surface of the concrete.

Definition of water cement ratio : The water cement (W/C) ratio is defined as the weight of water in mix
(including the surface moisture of the aggregates) divided by the weight of the cement in the mix.

Water cement ratio : The actual water cement ratio to be adopted shall be determined in each instance by contractor and approved by the Engineer-in-charge.

Proportioning by water-cement ratio : The W/C ratio specified for use by the Engineer-in-Charge shall be maintained. Contractor shall determine the water content of the aggregate as frequently as directed by the Engineer- in-Charge as the work progresses and as specified in I.S. 2386 part III and the amount of mixing water added at the mixer shall be adjusted as directed by the Engineer-in-charge so as to maintain the specified W/C ratio. To allow for the variation in their moisture content, suitable adjustments in the weights of aggregates shall also be made.

4.4.3.2 Consistency and slump : Concrete shall be of a consistency and workability suitable for the conditions of the job. After the amount of water required is determined, the consistency of mix shall be maintained throughout the progress of the corresponding parts of the work and approved tests e.g. slump tests, compacting factor tests etc. in accordance with I.S. 1199, shall be conducted from time to time to ensure the maintenance of such consistency.

The following tabulation gives a range of workability which shall generally be used for various types of construction unless other wise instructed by the Engineer-in-Charge.

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Workability of Concrete :

Placing condition	Degree of workability	Slump (mm)
(1)	(2)	(3)
Blinding Concrete; Shallow Sections; Pavement using pavers	Very low	See note 1.
Mass concrete; Lightly reinforced Sections in slabs, Beams, walls, columns; Floors; Hand placed pavements; Canal lining; Strip footings	Low	25-75
Heavily Reinforced sections In slabs, beams, walls, columns, slip form work; pumped concrete	Medium	50-100 75-100
Trench fill, In-situ piling	High	100-150
Tremie Concrete	Very High	See note

Note : 1: For most of the placing conditions, internal vibrators (needle vibrators) are suitable. The diameter of the needle shall be determined based on the density and spacing of reinforcement bars and thickness of sections. For tremie concrete, vibrators are not required to be used.

2: the 'very low' category of workability where strict control is necessary, for example pavement quality concrete, measurement of workability by determination of compacting factor will be more appropriate than slump (see IS 1199) and a value of compacting factor of 0.75 to 0.80 is suggested.

3: In the 'Very high' category of workability, measurement of workability by determination of flow will be appropriate (see IS 9103).

PRODUCTION OF CONCRETE; QUALITY ASSURANCE MEASURES:

In order that the properties of the completed structure be consistent with the requirements and the Assumptions made during the planning and the design, adequate quality assurance measures shall be taken. The construction should result in satisfactory strength, serviceability and long term durability so as to lower the overall life-cycle cost. Quality assurance in construction activity relates to proper design use of adequate materials and components to be supplied by the producers, proper workmanship in the execution of works by the contractor and ultimately proper care during the use of structure including timely maintenance and repair by the owner.

Quality assurance measures are both technical and organizational. Some common cases should be specified in a general Quality Assurance Plan which shall identify the key elements necessary to provide fitness of the structure and the means by which they are to be provided and measured with the overall purpose to provide confidence that the realized project will work satisfactorily in service fulfilling intended needs. The job of quality control and quality assurance would involve quality audit of both the inputs as well as the outputs. Inputs are in the form of materials for concrete; workmanship in all stages of batching, mixing, transportation; placing, compaction and curing; and the related plant, machinery and equipments; resulting in the output in the form of concrete in place. To ensure proper performance, it is necessary that

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each step in concreting which will be covered by the next step is inspected as the work proceeds.

Each party involved in the realization of a project should establish and implement a Quality Assurance Plan, for its participation the project. Suppliers and contractors activities shall be covered in the plan. The individual quality assurance plans shall fit into the general Quality Assurance Plan. A quality assurance plan shall define the tasks and responsibilities of all persons involved ,adequate control and checking procedures, and the organization maintaining adequate documentation of building process and its results. Such documentation should generally include:

a) test reports and manufacturers certificate for materials, concrete mix design details;

b) pour cards for site organization and clearance for concrete placement;

c) record of site inspection of workmanship,

field tests d) non-conformance reports,

change orders;

e) quality control charts;

f) statistical analysis.

NOTE – Quality control charts are recommended wherever the concrete is in continuous production over considerable period.

2.4.3.3 Batching and mixing of concrete :

BATCHING

To avoid confusion and error in batching, consideration should be given to using the smallest practical number of different concrete mixes on any site or in any one plant. In batching concrete, the quantity of both cement and aggregate shall be determined by mass; admixture, if solid, by mass; liquid admixture may however be measured in volume or mass; water shall be weighed or measured by volume in a calibrated tank (see also IS4925)

Ready mixed concrete supplied by ready-mixed concrete plant shall be preferred. For large and medium project sites the concrete shall be sourced from ready-mixed concrete plants or from on site or off site batching and mixing plants (see IS 4926)

Except where it can be shown to the satisfaction of the engineer-in-charge that supply of properly graded aggregate of uniform quality can be maintained over a period of work, the grading of aggregate should be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions when required, the different sizes being stocked in separate stock – piles. The material should be stock-piled for several hours preferably a day before use. The grading of coarse and fine aggregate should be checked as frequently as possible , the frequency for a given job being determined by the engineer-in-charge to ensure that the specified grading is maintained.

The accuracy of the measuring equipment shall be within +/- 2 % of the quantity of cement being measured and within +/- 3 percent of the quantity of aggregate, admixtures and water being measured.

Proportion / Type and grading of aggregate shall be made by trial in such a way so as to obtain densest possible concrete. All ingredients of the concrete should be used by mass only.

Volume batching may be allowed only where weigh-batching is not practical and provided accurate bulk densities of materials to be actually used in concrete have earlier been

established. Allowance for bulking shall be made in accordance with IS 2386 (Part 3).

The mass volume relationship should be checked as frequently as necessary, the frequency for the given job being determined by engineer-in-charge to ensure that the specified grading is maintained.

It is important to maintain the water-cement ratio constant at its correct value. To this end determination of moisture contents in both fine and coarse aggregates shall be made as frequently as possible the frequency for a given job being determined by the engineer-in-charge according to weather conditions. The amount of the added water shall be adjusted to compensate for any observed variations in the moisture content. For the determination of moisture content in the aggregates IS 2386 (Part 3) may be referred to. To allow for the variation in mass of aggregate due to variation in their moisture content, suitable adjustments in the masses of aggregates shall also be made. In the absence of exact data only in the case of nominal mixes the amount of surface water may be estimated from the values given in table below.

Surface water carried by aggregate

Sr. No.	**Aggregate**	**Approximate quantity of surface water**	
		Percent by mass	**l/m 3**
(1)	(2)	(3)	(4)
i)	Very wet sand	7.5	120
ii)	Moderately wet sand	5.0	80
iii)	Moist sand	2.5	40
iv)	Moist gravel or crushed rock	1.25 –2.5	20 – 40
	Coarser aggregate less the water it will carry		

No substitutions in materials used on the work or alterations in the established propositions except as permitted as above shall be made without additional tests to show that the quality and strength of concrete are satisfactory.

MIXING:

Concrete shall be mixed in a mechanical mixer. The mixer should with IS 1791 and IS 12119. The mixers shall be fitted with water measuring (metering) devices. The mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency. If there is segregation after unloading from the mixer, the concrete should be remixed.

For guidance, the mixing time shall be at least 2 min. For other types of more efficient mixers, manufacturers recommendations shall be followed; for hydrophobic cement it maybe decided by the Engineer-in-Charge.

Workability should be checked at frequent intervals.

Dosage of retards, plasticisers and superplsticisors shall be restricted to 0.50,1.0 and 2.0 % respectively by weight of cementecious materials and unless higher value is agreed upon between the manufacturer and constructor based on performance test.

Each time the work stops, the mixer shall be cleaned out and when next commencing the mixing, the first batch shall have 10% additional cement to allow for sticking in the drum.

2.5 SAMPLING AND TESTING CONCRETE IN THE FIELD: Facilities required for sampling materials and concrete in the field, if Engineer-in-Charge so desires, shall be provided by contractor at no extra cost.

The following equipment with operator shall be made available at Engineers request (all must be in serviceable condition):

1.	Cast iron cube moulds 15 cm. Size	12 Nos.(min.)
2.	Slump cone complete with tamping rod	1 Set
3.	Lab. balance to weigh upto 5 kg. with sensitivity of 10 gm.	1 No.
4.	Laboratory balance of 2 kg. capacity and of sensitivity of 1	1 No.
5.	I.S. sieves for coarse and fine aggregates.	1 Set
6.	A set of measures from 5 ltrs. to 0.1 ltr.	1 Set
7.	Electric oven with thermostat upto 120 ^{0}C.	1 No.
8.	Pycnometer	1 No.
9.	Calibrated glass jar 1 ltr. Capacity	2 Nos.
10	Glass flasks and metal containers	As required
11	Concrete cube testing machine (optional)	1 No.

2.6. TESTING CHARGES : Different tests required to be carried out for concrete works including the mix design, cube tested as per the above specifications shall be got done by the contractor at his own cost in one of the approved laboratories. The choice of laboratory shall rest with the Department. All incidental charges / cost shall be borne by the contractor.

In case the testing is carried out by the Department in its laboratory at Anushaktinagar, Bombay - 400094, the contractor has to arrange to transport all the materials, cubes etc. to be tested, to the laboratory at Anushaktinagar at his own cost. The contractor shall bear the testing charges which are given below:

Sl.No.	Name of	Testing charges
1.	**Concrete** i) Crushing strength for cubes	Rs. 16/- per cube.
	ii) Design Mix (Determination for mix	Rs. 2000/- per mix design
2	**Aggregates:** i) Sieve analysis for combined grading	Rs. 65/- per test
	ii) Moisture content and absorption test	Rs. 65/- per test
	iii) Crushing value	Rs. 50/- per test
	iv)Specific gravity and bulk density	Rs. 30/- per test
	v) Void ratio	Rs. 25/- per test
3	**Bricks:** i) Absorption test	Rs. 25/- per test
	ii) Crushing strength	Rs. 40/- per test
4	**Core test in soil**	Rs. 25/- per test
5	**Physical test of cement** (set of following	Rs. 400/- per test

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	i) Initial and final setting time; ii) Fineness by sieve analyses iii) Sound ness iv) 3 and 7 days compressive strength	
6	**Non - Destructive Tests**: i) Rebound Hammer test	Rs. 1500 /- per visit for both tests
7	**Ply wood / Block Boards** i. Moisture content tests ii. Adhesion of Plies	Rs. 65/- per test Rs. 90/- per test Rs. 65/- per test
8	**Flush door shutters:** i. End immersion test ii. Glue adhesion	Rs.125/- per test Rs.125/- per test Rs. 65/- per test

2.7 SAMPLING AND STRENGTH TEST OF CONCRETE:

Samples from fresh concrete shall be taken as per I.S. 1199 and cubes shall be made, cured and tested at 28 days in accordance with I.S. 516 .

In order to get a relatively quicker idea of the quality of concrete, option tests on beams for modulus of rupture at 72 (+/-) 2 hours or at 7 days or compressive strength tests at 7 days may be carried out in addition to 28 days compressive strength tests. For this purpose, the values given in table below may be taken for general guidance in the case of concrete made with ordinary cement. In all cases, the 28 days compressive strength specified shall alone be the criterion for acceptance or rejection of the concrete. If however, from test carried out in particular job over a reasonably long period, it has been established to the satisfaction of the Engineer-in-Charge that a suitable ratio between 28 days compressive strength and modulus of rupture at 72 (+/-) 2 hours or 7 days or compressive strength at 7 days may be accepted, the Engineer-in-Charge may suitably relax the frequency of 28 days compressive strength, provided the expected strength values at the specified early age are consistently met.

Optional Tests Requirements of Concrete:

Grade of Concrete	**Compressive strength on 15 cm cubes min. at 7 days**	**Modulus of rupture by beam test min.**	
		At 72 (+/-) 2 hours N / mm2	**At 7 days N / mm2**
M 10	7.0	1.2	1.7
M 15	10.	1.5	2.1
M 20	13.	1.7	2.4
M 25	17.	1.9	2.7
M 30	20.	2.1	3.0
M 35	23.	2.3	3.2
M 40	27.	2.5	3.4

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2.7.2 Frequency of Sampling :

Sampling Procedure : A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested, i.e. the sampling should be spread over the entire period of concreting and cover all mixing units.

Frequency : The minimum frequency of sampling of concrete of each grade shall be in accordance with following:

Quantity of concrete in the work (in cum.)	Number of samples
1-5	1
6-15	2
16-30	3
31-50	4
51 and above	4 plus one additional for each additional

At least one sample shall be taken from each shift. Where concrete is continuous production unit, such as ready
- mixed concrete plant, frequency of sampling may be agreed upon mutually by suppliers and purchasers.

2.7.3 Test Specimen : Three test specimen shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7days or at the time of striking the form work or to determine the duration of curing or to check the testing error. Additional cubes may also be required for testing cubes cured by accelerated methods as described in I.S. 9013 - 1978. The specimen shall be tested as described in I.S. 516 - 1959.

2.7.4 Test Strength of Samples : The test strength of the samples shall be the average of the strength of three specimen. The individual variation should not be more than (+/-) 15 percent of the average.

2.7.5 Consistency : Slump test shall be carried out as often as demanded by the Engineer-in-Charge and invariably from the same batch of concrete from which the test cubes are made. Slump tests shall be done immediately after sampling.

2.7.6 Standard Deviation : Vide clause 4.4.2 of this specification.

2.8 ACCEPTANCE CRITERIA :

The concrete shall be deemed to comply with the strength requirements when both the following conditions are met:

(a) The mean strength determined from any group of four consecutive test results complies with the appropriate limits in column 2 of Table below

(b) Any individual test result complies with the appropriate limits in column of Table below.

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Note – In the absence of established value of standard deviation, the values given in (assumed standard deviation) may be assumed, and attempt should be made to obtain results of 30 samples as early as possible to establish the value of standard deviation.

Flexural Strength

When both the following conditions are met, the concrete complies with the specified flexural strength.

(a) The mean strength determined from any group of four consecutive test results exceeds the specified characteristic strength by at least 0.3 N/mm^2

(b) The strength determined from any test result is not less than the specified characteristic strength less 0.3N/mm^2

Quantity of Concrete Represented by Strength Test Results.

The quantity of concrete represented by a group of four consecutive test results shall include the batches from which the first and last samples were taken together with all intervening batches.

For the individual test result requirements given in column 2 of above table or in item (b) of flexural strength , only the particular batch from which the sample was taken shall be at risk.

Where the mean rate of sampling is not specified the maximum quantity of concrete that four consecutive test results represent shall be limited to $60m^3$

If the concrete is deemed not to comply pursuant to above the structural adequacy of the parts affected shall be investigated and any consequential action as needed shall be taken.

Concrete of each grade shall be assessed separately

Concrete is liable to be rejected if it is porous or honey-combed, its placing has been interrupted without providing a proper construction joint, the reinforcement has been displaced beyond the tolerances specified, or construction tolerances have not been met. However, the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of the Engineer-in-Charge.

2.9 ADMIXTURES :

Admixtures, if used shall comply with IS 9103. Previous experience with and data on such materials should be considered in relation to the likely standards of supervision & workmanship to the work being specified. Admixtures should not impair durability of the concrete not combined with the constituent to form harmful compounds nor increase the risk of corrosion of reinforcement.

The workability, compressive strength and the slump loss of concrete with & without the use of admixtures shall be established during the trial mixes before use of admixtures.

The relative density of liquid admixtures shall be checked for such drum containing admixtures and compared with the specified value before acceptance.

The chloride content of the admixtures shall be independently tested for each batch before acceptance. If two or more admixtures are used simultaneously in the same concrete mix data should be obtained to assess their interaction and to ensure their compatibility**.**

General :

Admixture may be used in concrete only with the approval of Engineer-in-charge based upon evidence that, with the passage of time neither the compressive strength nor its durability reduced. When admixtures are used, the designed concrete mix shall be corrected accordingly. Admixtures shall be used as per manufacturers instructions and in the manner and with the control specified by Engineer-in-Charge.

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i) Calcium Chloride : Calcium chloride shall not be used for accelerating set of the cement for any concrete containing reinforcement or embedded steel parts. When calcium chloride is permitted to be used, such as in mass concrete works, it shall be dissolved in water and added to the mixing water in an amount not to exceed 1.5 percent of the weight of cement in each batch of concrete.

ii) Air Entraining Agents : Where specified and approved by Engineer-in-charge, neutralized vinsol resin or any other approved air entraining agent may be used to produce the specified amount of air in the concrete mix and these agents shall conform to the requirements of ASTM standard 6.260, Air Entraining admixtures for concrete. The recommended total air content of the concrete is 4% (+/-) 1%. The method of measuring air content shall be as per I.S.1199.

iii) Retarding Admixtures : Where specified and approved by Engineer-in-Charge, retarding agents shall be added to the concrete mix in quantities specified by Engineer-in-Charge.

iv) Water Reducing Admixtures : Where specified and approved by Engineer-in-Charge, water reducing lignosulfonate mixture shall be added in quantities specified by Engineer-in-Charge. The admixtures shall be added in the form of a solution.

v) Water Proofing Agents : Where specified and approved by Engineer-in-Charge, chloride and sulphate free water proofing agents shall be added in quantities specified by Engineer-in-Charge.

vi) Other Admixtures : Engineer-in-Charge may at his discretion, instruct contractor to use any other admixture in the concrete.

2.10 INSPECTION OF STRUCTURES :

Immediately after stripping the form work, all concrete shall be carefully inspected and any defective work or small defects, either removed or made good before concrete has thoroughly hardened, as instructed by Engineer-in- Charge.

In case of doubt regarding the grade of concrete used or results of cube strength are observed to be lower than the designed strength as per specifications at 28 days, compressive strength test of concrete based on core test, ultrasonic test and/or load test shall be carried out by the digital ultrasonic concrete tester by an approved agency as directed by the Engineer-in-Charge all at the cost of the contractor. In case these tests do not satisfy the requirements, the Department will be at liberty to reject the concrete, and the contractor, at his own cost, has to dismantle and re-do the same or carry out such remedial measures as approved by the Department.

2.11 TESTING OF STRUCTURES :

2.11.1 Optional Tests : Engineer-in-charge, if he so desires, may order for tests to be carried out on cement, sand, coarse aggregate, water etc. in accordance with the relevant Indian Standards.

Tests on cement will be carried out by Department and shall include (i) fineness test, (ii) test for normal consistency, (iii) test for setting time, (iv) test for soundness, (v) test for compressive strength, (vi) test for heat of hydration (by experiment and by calculations) in accordance with I.S.269.

Tests on sand shall include (i) sieve test, (ii) test for organic impurities, (iii) decantation test for determining clay and silt content, (iv) specific gravity test, (v) test for unit weight and bulkage factor, (vi) test for sieve analysis and fineness modulus.

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Tests on coarse aggregate shall include (i) sieve analysis, (ii) specific gravity and unit weight of dry, loose and rodded aggregate, (iii) soundness and alkali aggregate reactivity, (iv) petrographic examination, (v) deleterious materials and organic impurities, (vi) test for aggregate crushing value.

The test on aggregates would normally be ordered to be carried out only if Engineer-in-charge feels the materials are not in accordance with the specifications or if the specified concrete strengths are not obtained and shall be performed by contractor at an approved test laboratory. Contractor shall have to pay all the charges of optional tests. If the work cubes do not give the stipulated strengths, Engineer-in-Charge reserves the right to ask contractor to dismantle such portions of the work, which in his opinion are unacceptable and re-do the work to the standards stipulated at contractors cost.

The unit rate for concrete shall be all inclusive including making preliminary mix design and test cubes, works cubes, testing them as per specifications, slump tests, optional tests etc. Complete. However, the Department will test the cubes departmentally. The contractor will have to make arrangements for transportation to the laboratory and testing charges will be borne by the contractor.

The contractor should also conduct **conclusive tests** such as ultrasonic pulse test, core test etc. to prove the suitability of concrete, in case cube tests give unsatisfactory results. The cost of the conclusive test should be borne by the contractor.

2.11.2 Core Test : The points from which cores are to be taken and the number of cores required, shall be at the discretion of the Engineer-in-Charge and shall be representative of the whole of concrete concerned. In no case, however, shall fewer than three cores be tested. Cores shall be prepared and tested as described in I.S. 516

2.11.3 Concrete in the member represented by a core test shall be considered acceptable if the average equivalent cube strength of the cores is equal to at least 85% of the cube strength of the grade of concrete specified for the corresponding age and no individual core has a strength less than 75%.

In case the core test results do not satisfy the requirements as above or where such tests have not been done, load test (see 4:11:3) may be resorted to.

2.11.3 Load Tests on Parts of Structure :

Load tests should be carried out as soon as possible after expiry of 28 days from the time of placing of concrete. The structure should be subjected to a load equal to full dead load of the structure plus 1.25 times the imposed load for a period of 24 hours and then the imposed load shall be removed.

Note: Dead load includes weight of the structural members plus weight of finishes and walls or partitions, if any, as considered in the design.

The deflection due to imposed load only shall be recorded. If within 24 hours of removal of the imposed load, the structure does not recover at least 75% of the deflection under super imposed load, the test may be repeated after a lapse of 72 hours. If the recovery is less than 80%, the structure shall be deemed to be unacceptable.

If the maximum deflection in mm. shown during 24 hours under load is less than $40L^2/D$, where L is the effective span in M. and D the overall depth of the section in mm, it is not necessary for recovery to be measured and the recovery provision as above will not apply.

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2.11.4 Other non-destructive test methods may be adopted, in which case the acceptance criteria shall be agreed upon between the Engineer-in-Charge and the Contractor and the test shall be done under expert guidance.

MEMBERS OTHER THAN FLEXURAL MEMBERS:

Members other than flexural members should be preferably investigated by analysis.

Non – destructive tests:

Non-destructive tests are used to obtain estimation of properties of concrete in the structure. The methods adopted include ultrasonic pulse velocity [see IS 13311 (Part 1)] and rebound hammer [IS 13311 (Part 2)], probe penetration, pull out and maturity. Non destructive tests provide alternatives to core tests for estimating the strength of concrete in a structure, or can supplement the data obtained from a limited number of cores. These methods are based on measuring a concrete property that bears some relationship to strength/ the accuracy of these methods, in part is determined by the degree of correlation between strength and the physical quality measured by the non-destructive tests.

Any of these methods may be adopted, in which case the acceptance criteria shall be agreed upon prior to testing.

2.11.5 Testing of Underground Water Tank/Septic Tank/Underground Structures :

The tank will be tested after the completion according to the procedure laid down here:

The middle compartment shall be filled first to its full height and the leakage if any shall be checked on its outer surfaces and if found, the same shall be examined carefully and defects rectified/grouted if necessary. The drop in level of surface of water shall also be recorded for 48 hours. If this drop in level exceeds 20 mm. and shows any leakage in the said walls, necessary steps shall be taken in consultation with the Engineer-in-Charge.

After this compartment is tested to the satisfaction of the Engineer-in-Charge, all water from middle compartment shall be pumped into side compartment to the full height and checked for water leakages from the outer surfaces of the tank as well as inner surface of the middle compartment. The drop in level of surface of water shall also be checked as stated above and defects rectified.

The external surface of the tank shall then be plastered and cured as per the specifications and back filling shall be taken up thereafter. The water from the compartments shall then be pumped out and the inner surface of the tank in all compartments then be checked and defects rectified.

After satisfactory completion of checks, internal plaster shall be taken up as specified in the specifications.

The contractor shall be responsible for carrying out the complete test, rectifying the leakages if any. The cost of providing all equipments, labour for carrying out tests shall be borned by the contractor. The rates quoted for concreting items for constructing under ground water tank shall be inclusive of testing of RCC tank for water tightness as per above specifications. The contractor shall make his own arrangement to tap the water from the departmental supply line for filling the tank, if supply of water stipulated under Schedule ‘A’. If supply of water not stipulated under Schedule ‘A’, the contractor shall make his own arrangement as per contract conditions at his own cost.

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2.11.6 Unsatisfactory Tests :

Should the results of any test prove unsatisfactory, or the structure shows signs of weakness, undue deflection or faulty construction, contractor shall remove and rebuild the member or members involved or carry out such other remedial measures as may be required by Engineer-in-Charge. Contractor shall bear the cost of so doing, unless the failure of the member or members to fulfill the test conditions is proved to be solely due to faulty design. The cost of load and other tests shall be borne by Contractor if the tests show unsatisfactory results; otherwise such costs will be borne by the Department.

2.12 CONCRETE IN ALKALI SOILS WATER & AGGREGATES:

Some aggregates containing particular varieties of silica may be susceptible to attack by alkalis (Na_2O and K_2O) originating from cement and other sources, producing an expansive reaction which can cause cracking and disruption of concrete. Damage to concrete from this reaction will normally only occur when all the following are present together.

a) A high moisture level, within the concrete;

b) A cement with high alkali content, or another source of alkali;

c) Aggregate containing an alkali reactive constituent.

Where the service records of particular cement / aggregate combination are well established, and do not include any instances of cracking due to alkali-aggregate reaction, no further precautions should be necessary. When the materials are unfamiliar, precautions should take one or more of the following forms:

a) Use of non-reactive aggregate from alternate sources

b) Use of low alkali ordinary Portland cement having total alkali content not more than 0.6 percent (as Na_2O equivalent).

Further advantage can be obtained by use of fly ash (Grade I) conforming to IS 3812or granulated blast furnace slag conforming to IS 12089 as part replacement of ordinary Portland cement (having total alkali content as Na_2O equivalent not more than 0.6 percent) provided fly ash content is at least 20 % or slag content is at least 50 percent.

c) Measures to reduce the degree of saturation of the concrete during service such as use of impermeable membranes

d) Limiting the cement content in the concrete mix and thereby limiting total alkali content in the concrete mix as per approval of Engineer- in-charge.

Chlorides in the concrete

Whenever there is chlorides in concrete there is an increased risk of corrosion of embedded metal. The higher the chloride content or if subsequently exposed to warm moist conditions, the greater the risk of corrosion. All constituents may contain chlorides and concrete may be contaminated by chlorides from the external environment. To minimise the chance of deterioration of concrete from harmful chemical salts, the levels of such harmful salts in concrete materials, that is, cement, aggregates, water and admixtures, as well as by diffusion from the environment should be limited. The total amount of chloride content (as Cl) in the concrete at the time of placing shall be as given below in the table.

Limits of Chloride Content of Concrete

Sl. No	Type or Use of Concrete	Maximum Total Acid soluble Chloride Content Expressed as kg/m^3 of
(1)	(2)	(3)
i)	Concrete containing metal and steam cured at elevated temperature and pre-stressed concrete	0.4
ii)	Reinforced concrete or plain concrete containing embedded metal	0.6
iii)	Concrete not containing embedded metal or any material requiring protection form chloride	3.0

The total acid soluble chloride content should be calculated from the mix proportions and the major chloride contents of each of the constituents. Whenever possible the total chloride content of the concrete should be determined as per the approval of the Engineer-in-Charge.

Sulphates in concrete:

Sulphates are present in most cements and in some aggregates; excessive amounts of water-soluble sulphate from these or other mix constituents can cause expansion and disruption of concrete. To prevent this, the total water-soluble sulphate content of the concrete mix, expressed as SO3, should not exceed 4 per cent by mass of the cement in the mix. The sulphate content should be calculated as the total from the various constituents of the mix as per the approval of the Engineer-in-Charge.

The 4 percent limit does not applied to concrete made with super sulphated cment complying with IS 6909 or as approved by the Engineer-in-Charge.

2.13 PREPARATION PRIOR TO CONCRETE PLACEMENT, FINAL INSPECTION & APPROVAL :

Before the concrete is actually placed in position, the inside of the form work shall be inspected to see that they have been cleaned and oiled. Temporary openings shall be provided to facilitate inspection, especially at bottom of columns and wall forms, to permit removal of saw dust, wood shavings, binding wire, rubbish, dirt etc. Opening shall be placed or holes drilled so that these materials and water can be removed easily. Such openings / holes shall be later suitably plugged.

The various traders shall be permitted ample time to install drainage and plumbing lines, floor and trench drain, conduits, hangers, anchors, inserts, sleeves, bolts, frames and other miscellaneous embedments to be cast in the concrete as indicated on the drawing or as necessary for the proper execution of the work. All such embedments shall be correctly positioned and securely held in the forms to prevent displacement during depositing and vibrating of concrete.

Slots, openings, holes, pockets etc. shall be provided in the concrete work in the positions indicated in the drawings or as directed by the Engineer-in-Charge.

Reinforcement and other items to be cast in concrete shall have clean surfaces that will not impair bond.

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Prior to concrete placement, all works shall be inspected and approved by Engineer-in-Charge, and if found unsatisfactory, concrete shall not be poured until all defects have been corrected at contractors cost.

Approval by Engineer-in-Charge of any and all materials and work as required herein shall not relieve contractor from his obligations to produce finished concrete in accordance with the drawings and specifications.

2.13.1 Rain or Wash Water :

No concrete shall be placed in wet weather or on a water covered surface. Any concrete that has been washed by heavy rain shall be entirely removed,if there is any sign of cement and sand having been washed away from the concrete mixture. To guard against damage which may be caused by rain, the works shall be covered with tarpaulins immediately after the concrete has been placed and compacted before leaving the work unattended. Any water accumulating on the surface of the newly placed concrete shall be removed by approved means and no further concrete shall be placed thereon until such water is removed. To avoid flow of water over/around freshly placed concrete, suitable drains and sumps shall be provided.

2.13.2 Bonding Mortar :

Immediately before concrete placement begins, prepared surfaces, except form work, which will come in contact with concrete to be placed, shall be covered with a bonding mortar of same strength of concrete.

2.13.3 Transportation :

All buckets, containers or conveyers used for transporting concrete shall be mortar-tight. All means of conveyance shall be adopted to deliver concrete of the required consistency and plasticity without segregation or loss of slump whatever method of transportation is employed. Chute shall not be used to transport the concrete without the written permission of the Engineer-in-Charge and concrete shall not be rehandled before placing.

2.13.4 Retempered or Contaminated Concrete :

Concrete must be placed in its final position before it becomes too stiff to work. On no account water shall be added after the initial mixing. Concrete which has become stiff or has been contaminated with foreign materials and which has not been placed within half an hour of mixing water with cement shall be rejected.

2.13.5 Cleaning of Equipment :

All equipments used for mixing, transporting and placing of concrete shall be maintained in clean condition. All pans, buckets, hoppers, chutes, pipe lines and other equipments shall be thoroughly cleaned after each period of placement.

2.13.6 Procedure for Placing of Concrete :

1 Engineers Approval of Equipment and Methods : Before any concrete is placed, the entire placing programme, consisting of equipment, layout proposed procedures and methods shall be submitted to Engineer-in- Charge and no concrete shall be of such size and design to ensure a practically continuous flow of concrete during depositing without segregation of materials, considering the size of the job and placement location.

2 Time Interval Between Mixing and Placing : Concrete shall be placed in its final position before the cement reaches its initial set and concrete shall normally be compacted in its final position within thirty minutes of leaving the mixer and once compacted it shall not be disturbed.

3 Avoiding Segregation : Concrete shall in all the cases be deposited as nearly as practicable directly in its final position and shall not be rehandled or caused to flow in a manner which will cause segregation, loss of materials, displacement of reinforcement,

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shuttering or embedded inserts or impair its strength. For locations where direct placement is not possible, and in narrow forms, contractor shall provide suitable prop and Elephant Trunks to confine the movement of concrete. Special care shall be taken when concrete is dropped from a height, especially if reinforcement is in the way, particularly in columns and thin walls.

4 Placing by Manual Labour : Except when otherwise approved by Engineer-in-Charge, concrete shall be placed in the shuttering by shovels or other approved implements and shall not be dropped from a height more than
1.0 m. or handle in a manner which will cause segregation.

5 Placing by Mechanical Equipment : The following specifications shall apply when placing of concrete by sue of mechanical equipment is specially called for while inviting bids or is warranted, considering the nature of work involved.

The control of placing shall begin at the mixer discharge. Concrete shall be discharged by a vertical drop into the middle of the bucket of hopper and this principle of a vertical discharge of concrete shall be adhered-to through out all stages of delivery until the concrete comes to rest in its final position.

Type of buckets : All concrete shall be conveyed from the mixer to the place of final deposit in suitable buckets, dumpers, containers which shall be leak-tight. All means of conveyance shall be adopted for delivering concrete to the required consistency/ workability and plasticity without segregation.

Central bottom dump buckets of a type that provides for positive regulation of the amount and rate deposition of concrete in all dumping position shall be employed.

Operation of Bucket : In placing concrete in large open areas, the bucket shall be spotted directly over the position designated and then lowered for dumping. The open bucket shall clear the concrete already in place and the height of drop shall not exceed 1.0 m. The bucket shall be opened slowly to avoid high vertical bounce. Dumping of buckets on the swing or in any manner which results in separation of ingredients or disturbance of previously placed concrete will not be permitted.

6 Placement in Restricted Forms : Concrete placed in restricted forms by borrows, buggies, cars, short chutes or hand shovelling shall be subject to the requirement for vertical delivery of limited height to avoid segregation and shall be deposited as nearly as practicable in its final position.

7 Chutting : Where it is necessary to use transfer chutes, specific approval of Engineer-in-Charge must be obtained to type, length, slopes, baffles, vertical terminal and timing of operations. These shall be so arranged that almost continuous flow of concrete is obtained at the discharge and without segregation. To allow for the loss of mortar against the sides of the chutes, the first mixes shall have less coarse aggregate. During cleaning of chutes, the waste water shall be kept clear of the forms. The concrete shall not be permitted to fall from the end of the chutes by more than 1.0 m. Chutes, when approved for use, shall have slopes not flatter than 1 vertical to 3 horizontal and not steeper than 1 vertical to 2 horizontal, chutes shall be of metal or metal line and of rounded cross section. The slopes of all chute sections shall be approximately same. The discharge end of the chutes shall be maintained above the surfaces of the concrete in the forms.

8 Placing by Pumping/ Pneumatic Placers : Concrete may be conveyed and placed by mechanically operated equipment e.g. pumps or pneumatic placers, only with the written permission of Engineer-in-Charge. The slump shall be held to the minimum, necessary for conveying concrete by this method.

When pumping is adopted, before pumping of concrete is started, the pipelines shall be lubricated with one or two batches of mortar composed of one part cement and two parts sand. The concrete mix shall specially designed to suit pumping. Care shall be taken to avoid

stoppages in work once pumping has started.

When pneumatic placer is used, the manufacturers advice on layout of pipeline shall be followed to avoid blockages and excessive wear. Restraint shall be provided at the discharge box to cater for the reaction at the end.

Manufacturers advice shall be followed regarding concrete quality and all other related matters when pumping/
pneumatic placing equipments are used.

9 Concrete in Layers : Concreting, once started, shall be continuous until the pour is completed. Concrete shall be placed in successive horizontal layers of uniform thickness ranging from 15 cm. to 90 cm. as directed by Engineer-in-Charge. These shall be placed as rapidly as practicable to prevent the formation of cold joints or planes of weakness between each succeeding layers within the pour. The thickness of each layer shall be such that it can be deposited before the previous layer has stiffened.

The bucket loads or other units of deposit, shall spotted progressively along the face of the layer with such overlap as will facilitate spreading the layer to uniform depth and texture with a minimum of shovelling stones into mortar rather than mortar on to stones. Such a condition shall be corrected by redesign of mix or other means, as directed by Engineer-in-Charge.

Bedding of Layers : The top surface of each pour and bedding planes shall be approximately horizontal unless otherwise instructed.

COMPACTION :

2.13.7 COMPACTION : Concrete shall be compacted during placing, with approved vibrating equipment, until the concrete has been consolidated to the maximum practicable density, is free of pockets of coarse aggregate and fits tightly against all form surfaces, reinforcement and embedded fixtures. Particular care shall be taken to ensure that all concrete placed against the form faces and into corners of forms or against hardened concrete at joints is free from voids or cavities. The use of vibrators shall be consistent with the concrete mix and caution is to be exercised not to over vibrate the concrete to the point of segregation.

1 Type of Vibrators : Vibrators shall conform to I.S. specifications. Type of vibrators to be used shall depend upon the structure where concrete is to be placed. Shutter vibrators, to be effective, shall be firmly secured to the form work which must be sufficiently rigid to transmit the vibrations and strong enough not to be damaged by it. Immersion vibrators shall have No load frequency amplitude and acceleration as per I.S.2505 depending on the size of the vibrator. Immersion vibrators in sufficient numbers and each of adequate size shall be used to properly consolidate all concrete. Tapping or external vibrating of forms by hand tools or immersion vibrators will not be permitted.

2 Use of Vibrators : The exact manner application and the most suitable machines for the purpose must be carefully considered and operated by experienced men. Immersion vibrators shall be inserted vertically at points not more than 450 mm. apart and withdrawn when air bubbles cease to come to the surface. Immersion vibrators shall be withdrawn very slowly. In no case shall immersion vibrators be used to transport concrete inside the forms. Particular attention shall be paid to vibration at the top of lift, e.g. in a column or wall.

3 Melding successive batches : When placing concrete in layers, which are advancing horizontally as the work progress, great care shall be exercised to ensure adequate vibration, blending and melding of the concrete between the successive layers.

4 Penetration of vibrators : The immersion vibrator shall penetrate the layer being placed and also penetrate the layer below while the under layer is still plastic to ensure good bond and

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homogeneity between the two layers and prevent the formation of cold joints.

5 Vibrating against reinforcement : Care shall be taken to prevent contact of immersion vibrators against reinforcement steel. Immersion vibrators shall not be allowed to come in contact with reinforcement steel after start of initial set. They shall also not be allowed to come in contact with forms or finished surfaces.

6 Use of Form Attached Vibrators : Form attached vibrators shall be used only with specific authorisation of Engineer-in-Charge.

7 Use of surface vibrators : The use of surface vibrators will not be permitted under normal conditions. However, for thin slabs, such as highways, runways and similar construction, surface vibrations by specifically designed vibrators may be permitted, upon approval of Engineer-in-Charge.

2.13.8 STONE POCKETS AND MORTAR PONDAGES : Formation of stone pockets or mortar pondages in corners and against faces of forms shall not be permitted. Should these occur, they shall be dug out, reformed and refilled to a sufficient depth and shape for thorough bounding as directed by Engineer-in-Charge.

2.13.9 PLACEMENT INTERVAL : Except when placing with slip forms, each placement of concrete in multiple lift work, shall be allowed to set for at least 24 hours after the final set of concrete and before the start of a subsequent placement.

1 Special Provision in Placing : When placing concrete in walls with openings, in floors of integral slab and beam construction and other similar conditions, the placing shall stop when the concrete reaches the top of the opening in walls or bottom horizontal surface of the slabs as the case may be. Placing shall be resumed before the concrete in place takes initial set, but not until it has had time to settle as determined by Engineer- in-charge.

2 Placing Concrete Through Reinforcing Steel : While placing concrete through reinforcing steel, care shall be taken to prevent segregation of the coarse aggregate. Where the congregation of steel make placing difficult, it may be necessary to temporarily move the top steel aside to get proper placement and restore reinforcing steel to design position.

2.13.10 BLEEDING : Bleeding or free water on top of concrete being deposited in to the forms, shall be caused to stop the concrete pour and the conditions causing this defect corrected before any further concreting is resumed.

2.14 CONSTRUCTION JOINTS AND KEYS :

Concrete shall be placed without interruption until completion of the part of the work between predetermined construction joints, as specified therein after. Time lapse between the pouring of adjoining units shall be as specified in the drawings or as directed by Engineer-in-Charge.

Construction joints and cold joints:

Joints are a common source of weakness and therefore it is desirable to avoid them. If this is not possible, their number shall be minimized . Concreting shall be carried out continuously up to construction joints the position and arrangement of which shall be indicated by the designer. Construction joints should comply with IS 11817.

Construction joints shall be placed at accessible locations to permit cleaning out of laitance, cement slurry and unsound concrete, in order to create rough/uneven surface . It is recommended to clean out laitance and cement slurry by using wire brush on the surface of joint immediately after initial setting of concrete and to clean at the same immediately thereafter. The prepared surface should be in a clean saturated surface dry condition when fresh concrete is placed, against it. In the case of construction joints at locations where the previous pour has been cast against shuttering the recommended method of obtaining a rough surface

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for the previously poured concrete is to expose the aggregate with a high pressure water jet or any other appropriate means.

Fresh concrete should be thoroughly vibrated near construction joints so that mortar from the new concrete flows between large aggregates and develop proper bond with old concrete. Where high shear resistance is required at the construction joints, shear keys may be provided. Sprayed curing membranes and release agent s should be thoroughly removed from joint surfaces.

If stopping of concreting becomes unavoidable anywhere, a properly formed construction joint shall be made where the work is stopped. Joints shall be either vertical or horizontal, unless shown otherwise in drawing. In case of an inclined or curved member, the joints shall be at right angles to the axis of the member. Vertical joints in walls shall be kept to a minimum. Vertical joints shall be formed against a stop board, horizontal joints shall be level and wherever possible, arranged, so that the joint lines coincide with the architectural features of the finished work. Battens, shall be nailed to the form work to ensure a horizontal line and if directed, shall also be used to form a grooved joint. For tank walls, similar work joints shall be formed as per I.S. 3370. Concrete that is in the process of setting shall not be disturbed or shaken by traffic either on the concrete itself or upon the shuttering. Horizontal and vertical construction joints and shear keys shall be located and shall conform in detail to the requirements of the plans unless otherwise directed by Engineer-in-Charge. Where not described, the joints shall be in accordance with the following:

1 Column Joints : In a column, the joint shall be formed 75 mm. below the lowest soffit of the beams including haunches if any. In flat slab construction the joint shall be 75 mm. below the soffit of column capital. At least 2 hours shall elapse after depositing concrete in column, piers or walls, before depositing in beams, girders or slabs supported thereon.

2 Beam and Slab Joints : Concrete in a beam shall be placed throughout without a joint but if the provision of a joint is unavoidable, the joint shall be vertical and at the centre or within the middle third of the span unless otherwise shown in drawing. Where a beam intersects a girder, the joints in the girder shall be offset a distance equal to twice the width of the beam and additional reinforcement provided for shear. The joints shall be vertical throughout the full thickness of the concrete member. A joint in a slab shall be vertical and parallel to the principal reinforcement. Where it is unavoidable at right angles to the principle reinforcement, the joint shall be vertical and at the middle of span.

3 Joints in Liquid Retaining Structures : Vertical construction joints in watertight construction will not be permitted unless indicated on the drawings. Where a horizontal construction joint is required to resist water pressure, special care shall be taken in all phases of its construction to ensure maximum watertightness.

4 Dowels : Dowels for concrete work, not likely to be taken up in the near future, shall be wrapped in tar paper and burlap.

5 Mass Foundations : Mass foundations shall be poured in lifts not exceeding 1.5 m. in height unless, otherwise indicated on the drawings and approved by Engineer-in-Charge.

6 Treatment of Construction Joints on Resuming Concreting : Drier shall be used for the top lift or horizontal pours to avoid a laitance. All laitance and loose stones shall be thoroughly and carefully removed by wire brushing/ hacking and surface washed.

Just before concreting is resumed, the roughened joint surface shall be thoroughly cleaned and loose matter removed and then treated with a thin layer of cement grout of proportion specified by Engineer-in-Charge and worked well into the surface. The new concrete shall be well worked specially against the prepared face before the grout mortar sets. Special care shall be taken to obtain thorough compaction and to avoid segregation of the concrete along the joint plane.

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2.15 CURING, PROTECTING, REPAIRING, AND FINISHING:

1 Curing : All concrete shall be cured by keeping it continuously damp for the period of time required for complete hydration and hardening to take place. Preference shall be given to the use of continuous sprays or ponded water, continuously saturated covering of sacking, canvas, hessain or other absorbent materials, or approved effective curing compounds applied with spraying equipment capable of producing a smooth, even textured coat. Extra precautions shall be exercised in curing concrete during cold and hot weather as outlined hereinafter. The quality of curing water shall be the same as that used for mixing concrete. Certain types of finish or preparation for overlaying concrete must be done at certain stages of curing process and special treatment may be required for specific concrete surface finish. Curing of concrete made of high alumina cement and supersulphated cement shall be carried out as directed by Engineer-in-Charge.

2 Curing with Water : Fresh concrete shall be kept continuously wet for a minimum period of 14 days from the date of placing of concrete, following a lapse of 12 to 24 hours after laying concrete. The curing of horizontal surfaces exposed to the drying winds shall however begin immediately the concrete has hardened. Water shall be applied to unformed concrete surfaces within 1 hour after concrete has set. Water shall be applied to formed surfaces immediately upon removal of forms. Quantity of water applied shall be controlled so as to prevent erosion of freshly placed concrete.

3 Continuous Spraying : Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances of hose sprinklers and spraying devices. Continuous fine mist spraying or sprinkling shall be used, unless otherwise specified or approved by Engineer-in-Charge.

4 Alternate Curing Methods : Whenever in the judgment of Engineer-in-Charge, it may be necessary to omit the continuous spray method, covering of clean sand or other approved means such as wet gunny bags, which will prevent loss of moisture from the concrete, may be used. Any type of covering which would stain or damage the concrete during or after the curing period, will not be permitted. Covering shall be kept continuously wet during the curing period. For curing of concrete in pavements, side-walks, floors, flat roofs or other level surfaces, the ponding method of curing is preferred. The method of containing the ponded water shall be approved by Engineer-in-Charge. Special attention shall be given to edges and corners of the slab to ensure proper protection to these areas. The ponded areas shall be kept continuously filled with water during the curing period.

5 Curing Compounds : Surface coating type curing compound shall be used only on special permission of Engineer-in-Charge. Curing compounds shall be liquid type while pigmented, conforming to U.S. Bureau of Reclamation Specification. No curing compound shall be used on surface where future blending with concrete, water or acid proof membrane or painting is specified.

6. Curing Equipment : All equipments and materials required for curing shall be on hand and ready for use before concrete is placed.

7. Moist Curing: Exposed surfaces of concrete shall be kept continuously in a damp or wet condition by ponding or by covering with a layer of sacking , canvas, hassian or similar materials and kept constantly wet for at least seven days from the date of placing concrete. In case of ordinary Portland cement and at least ten days where mineral admixtures or blended cement are used. The period of curing shall not be less than ten days of concrete exposed to dry and hot wheather conditions. In the case of concrete the mineral admixtures or blended cement are used, it is recommended that the above minimum periods may be extended to fourteen days as per the approval of the Engineer-in-Charge.

8. Membrane Curing: Approved curing compounds may be used in lieu of moist curing with the permission of Engineer-in-charge. Such compounds shall be applied to all exposed

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surfaces of the concrete as soon as possible after the concrete has set. Impermeable membranes such as poly ethylene sheeting covering, closely the concrete surface may also be used to provide effective barrier against evaporation.

For the concrete containing Portland pozzolona cement, Portland slag cement or mineral admixtures increased period of curing may be decided by Engineer-in-charge.

The rate of strength development at early age of concrete made with super sulphated cement is significantly reduced at lower temperatures. Super sulphated cement concrete is seriously affected by inadequate curing and the surface has to be kept moist for at least seven days or more as per the approval of the Engineer-in-Charge.

2.16 PROTECTING FRESH CONCRETE :

Fresh concrete shall be protected from the elements, from defacements and damage due to construction operations by leaving forms in place for ample period as specified later in this specification. Newly placed concrete shall be protected by approved means such as tarpaulins from rain, sun and winds. Steps as approved by Engineer-in-Charge, shall also be taken to protect immature concrete from damage by debris, excessive loading, vibrations, abrasion or contact with other materials etc. that may be warned against and prevented from disturbing green concrete during its setting period. If it is necessary that workmen enter the area of freshly placed concrete, Engineer-in-Charge may require that bridges be placed over the area.

2.17 REPAIR AND REPLACEMENT OF UNSATISFACTORY CONCRETE :

Immediately after the shuttering is removed, the surface of concrete shall be very carefully gone over and all defective areas called to the attention of Engineer-in-Charge who may permit patching of the defective areas or else reject the concrete unit either partially or entirely. Rejected concrete shall be removed and replaced by Contractor at no additional expense to the Department. Holes left by form bolts etc. shall be filled up and made good with mortar composed of one part of cement to one and half parts of sand passing through 2.36 mm. I.S. sieve after removing any loose stones adhering to the concrete. Mortar filling shall be struck off flush at the face of the concrete. Concrete surface shall be finished as described under the particular item of work.

Superficial honey combed surfaces and rough patches shall be similarly made good immediately after removal of shuttering, in the presence of Engineer-in-Charge and superficial water and air holes shall be filled in. The mortar shall be well worked into the surface with wooden float. Excess water shall be avoided. Unless instructed otherwise by Engineer-in-Charge, the surface of the exposed concrete placed against shuttering shall be rubbed down immediately on removal of shuttering to remove fine or other irregularities, care being taken to avoid damaging the surfaces. Surface irregularities shall be removed by grinding.

If reinforcement is exposes or the honey combing occurs at vulnerable position e.g. ends of beams or columns, it may be necessary to cut out the member completely or in part and reconstruct. The decision of Engineer-in-Charge shall be final in this regard. If only patching is necessary, the defective concrete shall be cut out till solid concrete is reached (or to a minimum depth of 25 mm.), the edges being cut perpendicular to the affected surface or with a small under cut if possible, anchors, tees or dowels shall be provided in slots whenever necessary to attach the new concrete securely in place. An area extending several centimetres beyond the edges and the surfaces of the prepared voids shall be saturated with water for 24 hours immediately before the patching material is placed.

1 Use of Epoxy : The use of epoxy for bonding fresh concrete used for repairs will be permitted upon written approval of Engineer-in-Charge. Epoxies shall be applied in strict accordance with the instruction of the manufacturer.

2 Method of Repair : Small size holes having surface dimensions about equal to

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the depth of the hole, holes left after removal of form bolts, grout insert holes and slots cut for repair of cracks shall be repaired as follows:

The hole to be patched shall be roughened and thoroughly soaked with clean water until absorption stops.

A 5 mm. thick layer of grout of equal parts of cement and sand shall be well brushed into the surface to be patched followed immediately by the patching concrete which shall be well consolidated with a wooden float and left slightly proud of the surrounding surface. The concrete patch shall be built up in 10 mm. thick layers. After an hour or more, depending upon weather conditions, it shall be worked off flush with a wooden float and a smooth finish obtained by wiping with hessian. Steel trowel shall not be used for this purpose. The mix for patching shall be of the same materials and in the same proportions as that used in the concrete being repaired, although some reduction in the maximum size of the coarse aggregates may be necessary and the mix shall be kept as dry as possible.

Mortar filling by air pressure (guniting) shall be used for repair of areas to large and/ or too shallow for patching with mortar. Patched surfaces shall be given a final treatment to match the colour and texture of the surrounding concrete. White cement shall be substituted for ordinary cement, if so directed by Engineering-in- Charge, to match the shade of the patch with the original concrete.

3 Curing of Patched Work : The patched area shall be covered immediately with an approved non- staining water-saturated material such as gunny bags, which shall be kept continuously wet and protected against sun and wind for a period of 24 hours. Thereafter, the patched area shall be kept wet continuously by a fine spray of sprinkling water for not less than 10 days.

2 Approval by Engineer-in-Charge : All materials, procedures and operations used in the repair of concrete and also the finished repair work shall be subject to the approval of Engineer-in-Charge. All fillings shall tightly bonded to the concrete and shall be sound, free from shrinkage cracks after the fillings have been cured and dried.

2.18 FINISHING :

This specification is intended to cover the treatment of concrete surfaces of all structures.

1 Finish for Formed Surfaces : The type of finish for formed concrete surfaces shall be as follows, unless otherwise specified by the Engineer in charge:

For surfaces against which backfill or concrete is to be placed, no treatment is required except repair of defective areas.

For surfaces below grade, which will receive waterproofing treatment, the concrete shall be free of surface irregularities which would interfere with proper application of the water-proofing materials which is specified for use.

Unless specified, surfaces which will be exposed when the structure is in service shall receive no special finish, except repair of damaged or defective concrete, removal of fins and abrupt irregularities, filling of holes left by form ties and rods and clean up of loose or adhering debris.

Surfaces which will be exposed to the weather and which would normally be levelled, shall be sloped for drainage. Unless the drawing specify a horizontal surface or shows the slope required, the tops of narrow surfaces such as staircase treads, walls, curbs and parapets shall be sloped across the width approx. as 1 in 30. Broader surfaces such as walkways, roads, parking areas and platforms shall be sloped about 1 in 50. Surfaces that will be covered by backfill or concrete, sub floors to be covered with concrete topping, terrazzo or quarry tile and similar surfaces shall be smooth, screeded and leveled to produce even surfaces. Surface irregularities shall not exceed
6mm. Surfaces which will not be covered by backfill, concrete or tile topping such as outside

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decks, floors of galleries and sumps, parapets, gutters, sidewalks, floors and slabs shall be consolidated, screeded and floated.

Excess water and laitance shall be removed before final finishing. Floating may be done with hand or power tools and started as soon as the screeded surface has attained a stiffness to permit finishing operations and these shall be the minimum required to produce a surface uniform in texture and free from screed marks or other imperfections. Joints and edges shall be tooled as called for on the drawings or as directed By Engineer-in-Charge.

2 Standard Finish for Exposed Concrete : Exposed concrete shall mean any concrete other than floors or slabs exposed to view upon completion of the job. Unless otherwise specified on the drawings, the standard finish for exposed concrete shall be of smooth finish.

A smooth finish shall be obtained with use of lined or plywood forms having smooth and even surfaces and edges. Panels and form linings shall be of uniform size and be as large as practicable and installed with closed joints. Upon removal of forms, the joint marks shall be smoothed off and all blemishes, projections etc. removed, leaving the surfaces reasonably smooth and unmarred.

3 Integral Cement Concrete Finish : When specified on the drawings, an integral cement concrete finish of specified thickness for floors and slabs shall be applied either monolithic or bonded, as specified in the drawings and as per I.S.2571. The surface shall be compacted and then floated with a wooden float or power floating machine. The surface shall be tested with a straight edge and any high and low spots eliminated. Floating or trowelling of the finish shall be permitted only after all surface water has evaporated. Dry cement or a mixture of dry cement and sand shall not be sprinkled directly on the surface of the cement finish to absorb moisture or to stiffen the mix.

4 Rubbed Finish : A rubbed finish shall be provided only on exposed concrete surfaces as specified on the drawings. Upon removal of forms, all fins and other projections on the surfaces shall be carefully removed, off sets leveled and voids and/ or damaged sections immediately saturated with water and repaired by filling with concrete or mortar of the same composition as was used in the surfaces. The surfaces shall then be thoroughly wetted and rubbed with carborandum or other abrasive. Cement mortar may be used in the rubbing, but the finished surfaces shall not be brush coated with either cement or grout after rubbing. The finished surfaces shall present a uniform and smooth appearance.

2.19 PROTECTION :

All concrete shall be protected against damage until final acceptance by Engineer-in-Charge.

2.20 FOUNDATION BEDDING, BONDING AND JOINTING :

All surfaces upon or against which concrete will be placed shall be suitably prepared by thoroughly cleaning, washing and dewatering as may be indicated in the plans or as Engineer-in-Charge may direct to meet the various situations encountered in the work.

Soft or spongy areas shall be cleaned out and back filled with either a soil cement mixture, lean concrete or clean sand fill compacted to minimum density of 90% Modified Proctor, unless otherwise mentioned in schedule of quantities.

Prior to construction of form work for any item where soil will not act as bottom form, approval shall be obtained from Engineer-in-Charge as to the suitability of the soil.

2.21 PREPARATION OF ROCK STRATA OF FOUNDATIONS :

To provide tight bond with rock foundations, the rock surface shall be prepared and the following general requirements shall be observed:

Concrete shall not be deposited on large sloping rock surface. Where required by Engineer-in-Charge or as indicated on the plans, the rock shall be cut to form rough steps or benches to provide roughness or a more suitable bearing surface.

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Rock foundation stratum shall be prepared by picking, barring, wedging and similar methods which will leave the rock in an entirely sound and unshattered condition.

Shortly before concrete is placed, the rock surface shall be cleaned with high pressure water and air jet even though it may have been previously cleaned in that manner.

Prior to placing concrete, the rock surface shall be kept wet for a period of 2 to 4 hours unless otherwise directed by the Engineer-in-Charge.

Before placing concrete on rock surfaces, all water shall be removed from depressions to permit through inspection and proper bonding of the concrete to the rock.

2.22 PREPARATION OF EARTH STRATA OF FOUNDATIONS :

All earth surfaces upon which or against which concrete is to be placed, shall be well compacted and free from standing water, mud or debris. Soft, yielding soils shall be removed and replaced with suitable earth and well compacted as directed by the Engineer-in-Charge. Where specified, lean concrete shall be provided in the earth stratum for eceiving concrete. The surface of absorptive soil against which concrete is to be placed shall b e moistened thoroughly so that no moisture will be drawn form the freshly placed concrete and later shall help to cure the concrete.

2.23 PREPARATION OF CONCRETE SURFACES :

Preparation of concrete surface upon which additional concrete is to be placed later, shall preferably be done by scarifying and cleaning while the concrete is between its initial and final set. This method shall be used wherever practicable and shall consist of cutting the surface with picks and stiff brooms and by use of an approved combination of air and water jet as directed by Engineer-in-charge. Great care shall be taken in performing this work to avoid removal of too much mortar and the weakening of the surface by loosening of aggregate. When it is not practicable to follow the above method, it will be necessary to employ air tools to remove laitance and roughen the surface.

The final required result shall be a pitted surface from which all dirt, unsound concrete, laitance and glazed mortar have been removed.

2.24 BONDING TREATMENT (MORTAR) :

After rock or concrete surfaces upon which new concrete is to be placed have been scarified, cleaned and wetted as specified herein, it shall receive a bonding treatment, immediately before placement of the concrete.

The bonding medium shall be a coat of cement sand mortar. The mortar shall have the same cement-sand proportion as the concrete which shall be placed on it. The water cement ratio shall be determined by placing conditions and as approved by Engineer-in-Charge.

Bonding mortar shall be placed in sufficient quantity to completely cover the surface about 10 mm. thick for rock surface and about 5 mm. thick for concrete surfaces. It shall be brushed or broomed over the surface and worked thoroughly into all cracks, crevices and depressions. Accumulations or puddles of mortar shall not be allowed to settle in depressions and shall be brushed out to a satisfactory degree as determined by Engineer-in-Charge.

Mortar shall be placed at such a rate that it can be brushed over the surface just in advance of placement of concrete. Only as much area shall be covered with mortar as can be covered with concrete before initial set in the mortar takes place. The amount of mortar that will be permitted to be placed at any one-time, or the area which is to cover, shall be in accordance with Engineer-in-Charge.

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2.25 CLEANING AND BONDING OF FORMED CONSTRUCTION JOINTS :

Vertical construction joints shall be cleaned as specified above or by other methods approved by Engineer-in- Charge. In placing concrete against formed construction joints, the surfaces of the joints, where accessible, shall be coated thoroughly with the specified bed-joint bonding mortar immediately before they are covered with concrete or by scrubbing with wire brooms, dipped into the fresh concrete. Where it is impracticable to apply such a mortar coating, special precautions shall be taken to ensure that the new concrete is brought into intimate contact with the surface of the joint by carefully puddling and spading with aid of vibrators and suitable tools.

2.26 EXPANSION AND CONTRACTION :

Provision shall be made for expansion and contraction in concrete by use of special type joints located as shown in the drawings. Construction joint surfaces shall be treated as specified in the specifications, shown in the drawings or as directed by Engineer-in-Charge.

2.27 HOT WEATHER REQUIREMENTS :

All concrete work performed in hot weather shall be in accordance with I.S. 456, except as herein modified. Admixtures may be used only when approved by Engineer-in-Charge.

Adequate provision shall be made to lower concrete temperatures by cool ingredients, eliminating excessive mixing, preventing exposure of mixers and conveyers to direct sunlight and the use of reflective paint, on mixers etc. The temperature of the freshly placed concrete shall not be permitted to exceed 300C.

Consideration shall be given to shading aggregate stock piles from direct rays of the sun and spraying stock piles with water, use of cold water available and burying, insulation, shading and/ or painting white the pipe lines and water storage tanks and conveyances.

In order to reduce loss of mixing water, the aggregates, wooden forms, subgrade, adjacent concrete and other moisture absorbing surfaces, shall be well wetted prior to concreting. Placement and finishing shall be done as quickly as possible.

Extra precautions shall be taken for the protection and curing of concrete. Consideration shall be given to continuous water curing and protection against high temperatures and drying hot wind for a period of at least 7 days immediately after concrete has set and after which normal curing procedures may be resumed.

2.28 PLACING CONCRETE UNDER WATER :

Under all ordinary conditions all foundations shall be completely dewatered and concrete placed in the dry. However, when concrete placement under water is necessary, all work shall conform to I.S.456 and procedure shall be as follows:

Method of Placement : Concrete shall be deposited under water by means of tremies or drop bottom buckets of approved type.

2.29 DIRECTION, INSPECTION AND APPROVAL :

All work requiring placement of concrete underwater shall be designed, directed and inspected with regard to the local circumstances and purposes. All under water concrete shall be placed according to the plans or specifications and as directed and approved by Engineer-in-Charge.

2.30 PRECAST CONCRETE & 4.31 PRECAST REINFORCED CONCRETE

Precast concrete & precast reinforced concrete shall comply with I.S. 456, and with the following requirements:

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2.31.1 General requirements : Precast reinforced concrete units such as columns, fencing posts, door and window frames, lintels, chajjas, copings, sills, shelves, slabs, louvers etc. shall be of grade of mix as specified and cast in forms or moulds. The forms / moulds shall be of fiber glass or of steel sections for better finish. Provision shall be made in the forms and moulds to accommodate fixing devices such as nibs, clips, hooks, bolts and forming of notches and holes. Precast concrete shall be cast on suitable bed or platform with firm foundation and free from wind. The contractor may precast the units on a cement or steel platform which shall be adequately oiled provided the surface finish is of the same standard as obtained in the forms. Each unit shall be cast in one operation. Contractor shall be responsible for the accuracy of the level or shape of the bed or platform. A suitable serial number and the date of casting shall be impressed or painted on each unit.

2.31.2 Concrete used for precasting the units should be well proportioned, mixed, placed and thoroughly compacted by vibrations or tamping to give a dense concrete free from voids and honeycombing.

2.31.3 Precast articles shall have a dense surface finish showing no coarse aggregate and shall have no cracks or crevices likely to assist in disintegration of concrete or rusting of steel or other defects that would interfere with the proper placing of the units. All angles of the precast units with the exception of the angles resulting from the splayed or chamfered faces shall be true right angles. The arises shall be clean and sharp except those specified or shown to be rounded. The wearing surface shall be true to the lines. On being fractured, the interior of the units should present a clean homogenous appearance.

2.31.4 The longitudinal reinforcement shall have a minimum cover of 12 mm or twice the diameter of the main bar, whichever is more, unless otherwise directed in respect of all items except fencing posts or electric posts where the minimum cover shall be 25 mm.

2.31.5 CURING

After having been cast in the mould or form the concrete shall be adequately protected during setting in the first stages of hardening from shocks and from harmful effects of frost, sunshine, drying winds and cold. The concrete shall be cured at least for 7 days from the date of casting.

2.31.6 The precast articles shall be matured for 28 days before erection or being built in so that the concrete shall have sufficient strength to prevent damage to units when first handled. Side shutters shall not be struck in less than 24 hours after depositing concrete and no precast unit shall be lifted until the concrete reaches a strength of at least twice the stress to which the concrete may be subjected at the time of lifting.

2.31.7 Marking

Precast units shall be clearly marked to indicate the top of member and its location and orientation in the structure.

2.31.8 Precast units shall be stored, transported and placed in position in such a manner that they will not be overstressed or damaged. The lifting and removal of precast units shall be undertaken without causing shocks, vibration or under bending stresses to or in the units. Before lifting and removal takes place, contractor shall satisfy Engineer-in-Charge or his representative that the methods he proposes to adopt for these operations will not over- stress or otherwise affect seriously the strength of the precast units. The reinforced side of the units shall be distinctly marked.

2.32 PRECAST CEMENT CONCRETE JALI :

2.32.1 The Jali shall be of cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 stone aggregate 6 mm nominal size) reinforced with 1.6 mm thick mild steel wire, unless otherwise specified.

2.32.2 Fixing : The Jali shall be set in position true to plumb and level before the joints, sills and soffits of the openings are plastered. It shall then be properly grouted with cement mortar 1:3 (1 cement : 3 coarse sand) and rechecked for levels. Finally the jambs, sills and soffits shall be plastered embedding the jali uniformly on all sides.

2.32.3 Measurement : The Jali shall be measured for its gross superficial area. The length and breadth shall be measured correct to a cm. The thickness shall not be less than that specified.

2.32.4 Rate : The rate shall be inclusive of materials and labour involved in all the operations described above except plastering of jambs, sill and soffits, which will be paid for under relevant items of plastering.

2.33 CURING :

All precast work shall be protected from the direct rays of the sun for at least 7 days after casting and during that period each units shall be kept constantly watered or preferably by completely immersed in water if the size of unit so permits. Otherwise curing practices as given in clauses stated earlier shall be followed.

2.34 SLOTS, OPENINGS ETC. :

Slots, openings or holes, pockets etc. shall be provided in the concrete work in the positions indicated in the drawings or as directed by the Engineer-in-Charge. Any deviation from the approved drawings shall be made good by contractor at his own expenses without damaging any other work. Sleeves, bolts, inserts etc. shall also be provided in concrete work where so specified.

2.35 GROUTING :

2.35.1 Standard Grout : Grout shall be provided as specified in the drawing.

The proportions of grout shall be such as to produce a flowable mixture consistent with minimum water content and shrinkage. The grout proportions shall be limited as follows:

Use	Grout thickness	Mix. proportions	W/C. Ratio in (Max.)
a)Flui d mix	Under 25 mm.	One part Portland cement to one part	0.44
b) General	25 mm. and over but less than 50	One part Portland cement to 2 parts of	0.53
c) Stiff mix.	50 mm. and over	One part Portland cement to	0.53

Sand shall be such as to produce a flowable grout without any tendency to segregate. Sand, for general grouting purposes, shall be graded within the following limits:

Passing I.S. sieve 2.36 mm.	95 to 100%
Passing I.S. sieve 1.18 mm.	65 to 95%
Passing I.S. sieve 300 micron above	10 to 30%
Passing I.S. sieve 150 micron above	3 to 10%

Sand for fluid grouts shall have the fine material passing the 300 and 150 micron sieves at the upper limits specified above. Sand for stiff grouts, shall meet the usual grading specifications and concrete.

Surface to be grouted shall be thoroughly roughened and cleaned of all foreign matter and laitance.Anchor bolts, anchor bolt holes and bottom of equipment and column base plates shall be cleaned of all oil, grease, dirt and loose material. The use of hot, strong, caustic

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solution for this purpose will be permitted.Prior to grouting, the hardened concrete surfaces to be grouted, shall be saturated with water. Water in anchor bolt holes shall be removed before grouting is started.Forms around base plates shall be, reasonably, tightened to prevent leakage of the grout.Adequate clearance shall be provided between forms and base plate to permit grout to be worked properly into place.

Grouting, once started shall be done quickly and continuously to prevent segregation, bleeding and breakdown of initial set. Grout shall be worked from one side of one end to the other to prevent entrapment of air. To distribute the grout and to ensure more release from entrapped air, link chains can be used to work the grout into place. Grouting through holes in base plate shall be by pressure grouting. Variations in grout mixes and procedures shall be permitted if approved by the Engineer-in-Charge.

2.35.2 Special Grout : Special grout where specified on the drawing shall be provided in strict accordance with the manufacturers instructions/ specifications on the drawings.

2.36 INSPECTION :

All materials, workmanship and finished construction shall be subject to the continuous inspection and approval of Engineer-in-Charge.

All rejected materials supplied by contractor and all rejected work or construction performed by contractor, as is not in conformance with the specifications and drawings, shall immediately be replaced at no additional expense to the Department. Approval of any preliminary material or phase of work shall in no way relieve the contractor from the responsibility of supplying concrete and/ or producing finished concrete in accordance with the specifications and drawings.

All concrete shall be protected against damage until final acceptance by the Department or its representatives.

2.37 CLEAN UP :

Upon the completion of concrete work, all forms, equipments, construction tools, protective coverings and any debris resulting from the work shall be removed from the premises. All debris i.e. empty containers, scrap wood etc. shall be removed to dump daily or as directed by the Engineer- in-Charge. The finished concrete surfaces shall be left in a clean condition to the satisfaction of the Engineer-in-Charge.

2.38 PLAIN CEMENT CONCRETE FOR GENERAL WORK :

For plain cement concrete work, the specification for materials viz. cement, sand, fine and coarse aggregates and water shall be the same as that specified in reinforced concrete work specification.

But the proportion of mix will be nominal and the ratio of fine and coarse aggregate may be slightly adjusted within limits, keeping the total value of aggregates to a given volumes of cement constant to suit the sieve analysis of both the aggregates. Cement shall on no account be measured by volume, but it shall always be used directly from the bags (i.e. 50 kg/bag).

The proportion of cement, sand, aggregate and water for concrete of proportion 1:5:10, 1:4:8, 1:3:6 & 1:2:4 by volume shall generally consist of quantities as given below :

Proportion of Ingredien	Cement	Quantity of materials used per bag of			Water
		Fine aggregate	Coarse aggrega	Total of fine sand coarse	
1:5:10	1	175 ltrs.	350 ltrs.	800 kgs.	60 ltrs.
1:4:8	1	140 ltrs.	280 ltrs.	625 kgs.	45 ltrs.
1:3:6	1	105 ltrs.	210 ltrs.	480 kgs.	34 ltrs.
1:2:4	1	70 ltrs.	140 ltrs.	330 kgs.	32 ltrs.

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The quantity of water used shall be such as to produce concrete of consistency required by the particular class of work and shall be decided by the use of a slump cone. Sufficient care should be taken to see that no excess quantity of water is used. The final proportion of the aggregate and quantity of water shall be decided by the Engineer-in-charge on the basis of test in each case.

Mix proportion	Cement in	Sand in cum	Coarse Aggregate in CUM			Water
Ordinary mix in			40 mm	20 mm	12 mm	
1:5:10	2.60	0.475	0.6623	0.2583	-	156
1:4:8	3.40	0.500	0.6883	0.6883	-	153
1:3:6 (with 40mm	4.4	0.485	0.672	0.672	0.262	176
1:3:6 (with 20 mm	4.4	0.485	-	0.727	0.242	162.5
1:2:4 (with 20 mm	6.4	0.47	-	0.705	0.235	205
1:2:4 (with 40 mm	6.4	0.47	0.544	0.241	0.126	235
1:1.5:3	8.0	0.441	-	0.6615	0.2205	240
1:1:2	12.20	0.45	-	0.675	0.225	330

The slump shall be specified for each class of work and shall in general be as follows:

Type of concrete	Max. slump (in
Mass concrete	50
Concrete below water proofing treatment	50
Coping	25
Floor paving	50

All plain concrete should be preferably mixed in a drum type powder driven machine with a loading hopper which will permit the accurate measure of various ingredients. If hand mixing is authorised, it should be done on a water tight platform.

The mixing of each batch in the concrete mixer shall continue for not less than 1.5 minutes after the materials and water are in the mixer. The volume is mixed materials per batch shall not exceed the manufacturers rated capacity of the mixer. The mixer shall rotate at a peripheral speed of about 60 metres per minute.

Concrete shall be poured and consolidated in its final position within half an hour of mixing. The retempering of concrete which has partially hardened, that is remixing with or without additional cement aggregate or water shall not be permitted. Concrete of mix 1:3:6 and 1:2:4 will be required to be vibrated if specified and directed by the Engineer. In case of the thickness of concrete is more than 150 mm., it may be vibrated as directed by the Engineer.

The concrete shall be cured for 10 days in ordinary weather and 15 days in hot weather.

Measurements for the work done shall be exact length, breadth and depth shown in figures on the drawings or as directed by the Engineer and after the concrete is consolidated. No extra shall be paid for excess quantity resulting from faulty workmanship.

2.39 SPECIFIC REQUIREMENTS FOR CONCRETE AND ALLIED WORKS :

The following specific requirements shall be met within addition to those provided in the clause of specification for Concrete and allied works.

2.39.1 General : If so specified in Schedule 'A' for the work, the Department shall supply with specification for "Concrete and allied works" and the contractor shall be solely responsible for supplying mixed concrete in accordance with the specification for concrete and allied works and also this specification. The rates for the reinforced concrete work shall be based on the issue rates of cement and steel as given in the schedule 'A'.

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2.39.2 Water : Clean water in pipes under pressure shall be provided by the contractor with all necessary equipment for giving a nozzle pressure of not less than 2.0 kg/ sqcm. for the convenient and effective jetting of rock foundations and concrete surfaces, for cooling aggregate required for concrete, for curing concrete and other requirements.

2.39.3 Fire Protection System : The contractor shall provide and maintain at all times in adequate fire protection system to protect his equipment, materials and construction In case of an emergency, the contractor shall permit the Engineer-in-Charge to use the system for protecting equipment, works etc. on the project.

2.39.4 Concrete : The rates for all concrete work should be based as per specifications and taking into consideration the guidelines indicated in special instruction under relevant clause.

2.39.5 The Placement Intervals : Each placement of concrete shall be allowed to set for a period of 48 hours and longer when required, before the start of subsequent placement. A time gap between the two adjoining pours in the horizontal plane and the two adjacent pours in the vertical plane shall be 7 days and 3 days respectively.

2.39.6 Finishing of Concrete :

1 General : Unless otherwise specified, concrete finishes shall conform to the

following specifications: Finish F1, F2 and F3 shall describe formed surface.

Finish U1, U2 and U3 shall describe un-formed surface.

Off sets or fins caused by disposed or misplaced form sheathing lining or form sections or by defective form lumber shall be referred to as abrupt irregularities. All other irregularities shall be referred to as gradual irregularities. Gradual irregularities shall be measured as deviation from a plane surface with a template 1.5 m. long for formed surface and 3 m. long for unformed surfaces.

2 Formed Surfaces :

Finish F1—shall apply to all formed surfaces for which finish F2, F3 or any other special finish is not specified and shall include filling up all form tie holes.

Finish F2—shall apply to all formed surfaces so shown on the drawings or specified by the Engineer-in- Charge. This shall include filling all form tie-holes, repair of gradual irregularities exceeding 6 mm., removal of ridges and abrupt irregularities by grinding.

Finish F3—shall apply to all formed surfaces exposed to view or where shown in the drawings or specified by the Engineer-in-Charge. Finish F3 - shall include all measures specified for Finish-F2 and in addition, Filling air holes with mortar and treatment of the entire surface with sack rubbed finish. It shall also include clean up of loose and adhering debris. Where a sack rubbed finish is specified, the surfaces shall be prepared within two days after removal of the forms.

The surface shall be wetted and allowed to dry slightly before mortar is applied by sack rubbing. The mortar used shall consist of one part cement to one and half parts by volume of fine (minus No. 16 mesh) sand. Only sufficient mixing water to give the mortar a workable consistency shall be used. The mortar shall then be rubbed over the surface with a fine burlap or linen cloth so as to fill all the surface voids. The mortar rubbed in the voids shall be allowed to stiffen and solidify after which the whole surface shall be wiped clean so that the surface presents a uniform appearance without air holes, irregularities etc.

Curing of the surface shall be continued for a period of ten (10) days.

3 Unformed Surfaces :

Finish U1—shall apply to all unformed surfaces for which the finish U2, U3 or any other special finish is not specified and shall include screeding the surface of the concrete to the required slope and grade. Unless the drawing specifies a horizontal surface or shows the slope required, the tops of narrow surfaces such as stair, treads, walls, curbs and parapets shall be sloped approximately 10 mm. per 300 mm. width. Surfaces to be covered by backfill or concrete sub-floors to be covered with concrete topping, terrazzo and similar surfaces shall be smooth screeded and leveled to produce even surface, irregularities not exceeding 6 mm.

Finish U2—shall apply to all unformed surfaces as shown in the drawing or specified by the Engineer-in-Charge and shall include screeding and applying a wood float finish to the surface of the concrete to the required slopes and grade.

Repair of abrupt irregularities unless a roughened texture is specified. Repair of gradual irregularities exceeding 6 mm.

Finish U3—shall apply to unformed surfaces for which a high degree of surface smoothness is required, where shown on the drawing or specified by the Engineer-in-Charge. This shall include screeding, floating and applying a steel trowel finish to the surface of the concrete to the required slopes and grade. Repair of abrupt irregularities.

Repair of gradual irregularities exceeding 6 mm., finishing joints and edges of concrete with edging tools.

4.40 MODE OF MEASUREMENT FOR CONCRETE WORK :

General : Concrete as actually done shall be measured for payment, subject to the following tolerances, unless otherwise stated hereinafter. Any work done extra over the specified dimensions shall not be measured for payment.

a) Linear dimensions shall be measured in full centimetres except for the thickness of slab which shall be measured to the nearest half centimetre.

b) Areas shall be worked out to the nearest 0.01 sqm.

c) Cubic contents shall be worked out to the nearest 0.001 cum.

d) The concrete shall be measured for its length, breadth and height/ depth limiting dimensions to those specified on drawings or as directed by the Engineer-in-Charge.

NOTE : The sizes of RCC members as assumed in the estimate are based on preliminary drawings and are likely to be changed. The contractor is not entitled to any extra claim due to such changes.

Deductions:

No deductions shall be made for the following :

a) Ends of dissimilar materials e.g. joists, beams, posts, girders, rafters, purlins, trusses, corbels, steps etc. upto 500 sq cm. in cross section.

b) Opening upto 0.1 sqm. (1000 sq cm)

c) Volume occupied by reinforcement.

d) Volume occupied by pipes, conduits, sheathing etc. not exceeding 25 sq cm. each in cross sectional area. Nothing extra shall be paid for leaving and finishing such cavities and holes.

i) COLUMN FOOTING :

R.C.C. in foundation and footings shall be measured for its length, breadth and depths limiting dimensions to those specified in drawing or as ordered in writing by the Engineer-in-Charge. In case of tapering portions of column footings, the quantities shall be calculated by the

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Formula : **Volume V = H/3 x [A1 + A2 + sqrt {A1 x A2}]** ; where A1 = Area at top of footing, A2 = Area at bottom of footing and H = Height of footing.

ii) COLUMN :

Column shall be measured from top of footings to the plinth level and from plinth level to the structural slab level and to the subsequent structural slab levels. Measurements for higher grade concrete in columns at its junction with lower grade concrete beams shall be restricted to the column section supporting the beam in question.

iii) WALL :

All walls shall be measured from top of the wall footing to the plinth level and from plinth level to the top of structural first floor and to subsequent floors.

iv) BEAM AND LINTEL :

Beam shall be measured from face to face of the columns, walls, cross beams including haunches if any. The depth of the beams shall be measured from the top of the slab to the bottom of the beam except in the case of inverted beam where it shall be measured from top of slab to top of beams. The beams and lintels with narrow width even though acting as facia in elevation in some cases, will be measured as beams and lintels only.

v) SLAB :

The length and breadth of slab laid to correct thickness as shown in the detailed drawings or as ordered by the
Engineer-in-Charge shall be measured between beams, walls and columns.

vi) CHAJJAS, FACIAS, FINS AND MULLIONS:

a) Chajjas shall be measured net from supporting faces upto the edges of chajjas

without any facia. b) Facia shall be measured full excluding chajja thickness.

c) End fins shall be measured full.

d) Intermediate fins, mullions shall be measured between chajjas or other supporting

structural members. e) Parapets shall be measured from top of slab/ chajja.

vii) STAIRCASE :

The concrete in all members of staircase like waist slabs, steps, cantilever steps, stringer beams etc. shall be measured for their length, breadth and depth, limiting dimensions to those specified on drawings. No deductions shall be made for embedded plugs, pockets.

Rates: The rate for P.C.C/ R.C.C. shall include the cost of all materials, labour, transport, tools and plants and all the operations mentioned hitherto, including or excluding the cost of form work and/ or reinforcement as mentioned in the schedule of quantities. The rates also shall include the cost of testing materials, mix design, cube test and allied incidental expenses.

3. FORM WORK :

3.0 GENERAL : The form work shall consist of shores, bracings, sides of beams and columns, bottom of slabs etc. including ties, anchors, hangers, inserts etc. complete which shall be properly designed and planned for the work. The false work shall be so constructed that up and down vertical adjustment can be made smoothly. Wedges may be used at the top or bottom of timber shores, but not at both ends, to facilitate vertical adjustment or dismantling of form work.

3.1 DESIGN OF FORM WORK :

The design and engineering of form work as well as its construction shall be the responsibility of Contractor. If so instructed, the drawings and calculations for the design of the form work shall be submitted well in advance to the Engineer-in-Charge for approval before

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proceeding with work, at no extra cost to the Department. Engineer-in-Charges approval shall not however, relieve Contractor of the full responsibility for the design and construction of the form work. The design shall take into account all the loads vertical as well as lateral that the forms will be carrying including live and vibration leadings.

3.2 TOLERANCES :

Tolerances are a specified permissible variation from lines, grade or dimensions given in drawings. No tolerances specified for horizontal or vertical building lines or footings shall be constructed to permit encroachment beyond the legal boundaries. Unless otherwise specified, the following tolerances will be permitted:

3.2.1 Tolerances for R.C. Buildings :

i) Variation from the plumb:

a) In the line and surfaces of columns, piers, walls and in buttresses: 5 mm. per 2.5 m., but not more than 25

b) For exposed corner columns and other conspicuous lines.
In any bay or 5 m. maximum: (+/-) 5 mm. In 10 m. or more: (+/-) 10 mm.

ii) Variation from the level or from the grades indicated on the drawings.

a) In slab soffits, ceilings, beam soffits and in arrises.
In 2.5 m.: (+/-) 5 mm.
In any bay or 5 m. maximum: (+/-) 8 mm.
In 10 m. or more: (+/-) 15 mm.

b) For exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines. In any bay or 5 m. maximum: (+/-) 15 mm.
In 10 m or more: (+/-) 10 mm.

iii) Variation of the linear building lines from established position in plan and related position of columns, walls and partitions.
In any bay or 5 m. maximum: (+/-) 10 mm. In 10 m. or more: (+/-) 20 mm.

iv) Variations in the sizes and locations of sleeves, openings in walls and floors except in the case of and for anchor bolts: (+/-) 5 mm.

v) Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls: (+)10 mm./(-) 5 mm.

vi) Footings:

a) Variation in dimensions in plan: (+) 50 mm./(-) 5 mm.

b) Misplacement or eccentricity: 2% of footing within the direction of misplacement but not more than 50 mm. c) Reduction in thickness: (-) 5% of specified thickness subject to maximum of 50 mm.

vii) Variation in steps.

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a) In a flight of stairs.
Rise: (+/-) 3.0 mm.
Tread: (+/-) 5.0 mm.

b) In consecutive steps.
Rise: (+/-) 1.5 mm.
Tread: (+/-) 3 mm.

3.2.2 Tolerances in other Concrete

Structure : A) All structures:

i) Variation of the constructed linear outline from established position in plan.
In 5 m.: (+/-) 10 mm.
In 10 m. or more: (+/-) 15 mm.

ii) Variation of dimensions to individual structure features from established positions in plan. In 20 m. or more: (+/-) 25 mm.
In buried constructions: (+/-)150 mm.

iii) Variation from plumb, from specified batter or from curved surfaces of all structures. In 2.5 m.: (+/-) 10 mm. In 5.0 m.: (+/-) 15 mm. In 10.0 m. or more: (+/-) 25 mm.
In buried constructions: (+/-) Twice the above limits.

iv) Variation from level or grade indicated on drawings in slabs, beams, soffits, horizontal grooves and visible arises.
In 2.5 m.: (+/-) 5 mm. In 7.5 m. or more: (+/-) 10 mm.
In buried constructions: (+/-) Twice the above limits.

v) Variation in cross-sectional dimensions of columns, beams, buttresses, piers and similar members.
(+)12 mm./(-) 6 mm.

vi) Variation in the thickness of slabs, walls, arch sections and similar members.
: (+)12 mm./(-) 6 mm.

B) Footings for columns, piers, walls, buttresses and similar members:

i) Variation of dimensions in plan: (+)50 mm./(-)12 mm.
ii) Misplacement or eccentricity: 2% of footing within the direction of misplacement but not more than 50 mm. iii) Reduction in thickness: 5% of specified thickness subject to a maximum of 50 mm.

Tolerances in other types of structures shall generally conform to those given in Clause 2.4 of
Recommended Practice for concrete form work (ACI 347)

3.3 TYPE OF FORMWORK :

Form work may be of timber, plywood, metal, plastic or concrete. For special finishes, the formwork may be lined with plywood, steel sheets, oil tempered hard board etc. Sliding forms and slip forms may be used with the approval of Engineer-in- Charge.

3.4 FORMWORK REQUIREMENTS :

Forms shall conform to the shapes, lines, grades and dimensions including camber of the

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concrete as called for in the drawings. Ample studs, waler braces, straps, shores etc. shall be used to hold the forms in proper position without any distortion whatsoever until the concrete has set sufficiently to permit removal of forms. Forms shall be strong enough to permit the use of immersion vibrators. In special cases, from vibrators may also be used. The shuttering shall be close boarded. Timber shall be well seasoned, free form sap, shakes, loose knots, worm holes, warps or other surface defects in contact with concrete. Faces coming in contact with concrete shall be free from adhering grout, plaster, paint, projecting nails, splits or other defects. Joints shall be sufficiently tight to prevent loss of water and fine material from concrete.

Plywood shall be used for exposed concrete surfaces, where called for. Sawn and wrought timber may be used for unexposed surfaces. Inside faces of forms for concrete surfaces which are to be rubbed finished shall be planed to remove irregularities or unevenness in the face. Form work with lining will be permitted.

All new and used from lumber shall be maintained in a good condition with respect to shape, strength, rigidity, water tightness, smoothness and cleanliness of surfaces. Form lumber unsatisfactory in any respect shall not be used and if rejected by Engineer-in-Charge shall be removed from the site.

Shores supporting successive stories shall be placed directly over those below or be so designed and placed that the load will be transmitted directly to them. Trussed supports shall be provided for shores that cannot be secured on adequate foundation.

Formwork, during any stage of construction showing signs of distortion or distorted to such a degree that the intended concrete work will not conform to the exact contours indicated on the drawings, shall be repositioned and strengthened. Poured concrete affected by the faulty formwork, shall be entirely removed and the formwork corrected prior to placing new concrete.

Excessive construction camber to compensate for shrinkage settlement etc. that may impair the structural strength of members will not be permitted.

Forms for substructure concrete may be omitted when, in the opinion of Engineer-in-Charge, the open excavation is firm enough to act as the form. Such excavations shall be slightly larger than required by the drawings to compensate for irregularities in excavation and to ensure the design requirement.

Forms shall be so designed and constructed that they can be stripped in the order required and their removal do not damage the concrete. Face formwork shall provide true vertical and horizontal joints, conforming to the architectural features of the structure as to location of joints and be as directed by Engineer-in-Charge.

Where exposed smooth or rubbed concrete finishes are required, the forms shall be constructed with special care so that the desired concrete surfaces could be obtained which require a minimum finish.

BRACINGS, STRUTS AND PROPS :

Shuttering shall be braced, strutted, propped and so supported that it shall not deform under weight and pressure of the concrete and also due to the movement of men and other materials. Bamboos shall not be used as props or cross bracings.

The shuttering for beams and slabs shall be so erected that the shuttering on the sides of beams and under the soffit of slab can be removed without disturbing the beam bottoms.

Repropping of beams shall not be done except when props have to be reinstated to take care of construction loads anticipated to be in excess of the design load. Vertical props shall be supported on wedges or other measures shall be taken whereby the props can be gently lowered vertically while striking the shuttering.

If the shuttering for a column is erected for the full height of the column, one side shall be left open and built upon sections as placing of concrete proceeds, or windows may be left for

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pouring concrete from the sides to limit the drop of concrete to 1.0 m. or as directed by Engineer-in-Charge.

3.5 INSPECTION OF FORM WORK :

Following points shall be borne in mind while checking during erection of form work and form work got approved by the Engineer-in-charge before placing of reinforcement bars :

a) Any member which is to remain in position after the general dismantling is done, should be clearly marked. b) Material used should be checked to ensure that, wrong items / rejects are not used.

c) If there are any excavations nearby which may influence the safety of form works, corrective and strengthening action must be taken.

d) i) The bearing soil must be sound and well prepared and the sole plates shall bear well on the ground. ii) Sole plates shall be properly seated on their bearing pads or sleepers.

iii) The bearing plates of steel props shall not be distorted.

iv) The steel parts on the bearing members shall have adequate bearing areas.

e) Safety measures to prevent impact of traffic, scour due to water etc. should be taken. Adequate precautionary measures shall be taken to prevent accidental impacts etc.

f) Bracing, struts and ties shall be installed along with the progress of form work to ensure strength and stability of form work at intermediate stage. Steel sections (especially deep sections) shall be adequately restrained against tilting, over turning and form work should be restrained against horizontal loads. All the securing devices and bracing shall be tightened.

g) The stacked materials shall be placed as catered for, in the design. h) When adjustable steel props are used, they should :

i) be undamaged and not visibly bent.

ii) have the steel pins provided by the manufacturers for use. iii) be restrained laterally near each end.

iv) have means for centralising beams placed in the forkheads.

i) Screw adjustment of adjustable props shall not be over extended.

j) Double wedges shall be provided for adjustment of the form to the required position wherever any settlement / elastic shortening of props occurs. Wedges should be used only at the bottom end of single prop. Wedges should not be too steep and one of the pair should be tightended / clamped down after adjustment to prevent their shifting.

k) No member shall be eccentric upon vertical member.

l) The number of nuts and bolts shall be adequate.

m) All provisions of the design and / or drawings shall be complied with. n) Cantilever supports shall be adequate.

o) Props shall be directly under one another in multistage constructions as far as possible. p) Guy ropes or stays shall be tensioned properly.

q) There shall be adequate provision for the movement and operation of vibrators and other construction plant and equipment.

r) Required camber shall be provided over long spans.

s) Supports shall be adequate, and in plumb within the specified tolerances.

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3.6 FORM OIL :

Use of form oil shall not be permitted on the surface which require painting. If the contractor desire to use form oil on the inside of formwork of the other concrete structures, a non staining mineral oil or other approved oil CEMOL-35 of Ms. Hindustan Petroleum Co. Ltd. may be used, provided it is applied before placing reinforcing steel and embedded parts. All excess oil on the form surfaces and any oil on metal or other parts to be embedded in the concrete shall be carefully removed. Before treatment with oil, forms shall be thoroughly cleared of dried splatter of concrete from placement of previous lift.

3.7 CHAMFERS AND FILLERS :

All corners and angles exposed in the finished structure shall be formed with mouldings to form chamfers or fillers on the finished concrete. The standard dimensions of chamfers and fillets, unless otherwise specified, shall be 20 x 20 mm. Care shall be exercised to ensure accurate mouldings. The diagonal face of the moulding shall be planed or surfaced to the same texture as the forms to which it is attached.

3.8 VERTICAL CONSTRUCTION JOINT CHAMFERS :

Vertical construction joints on faces which will be exposed at the completion of the work shall be chamfered as above except where not permitted by Engineer-in-Charge for structural or hydraulic reasons.

3.9 WALL TIES :

Wire ties passing through the walls, shall not be allowed. Also through bolts shall not be permitted. For fixing of formwork, alternate arrangements such as coil nuts shall be adopted at the contractors cost.

3.10 REUSE OF FORMS :

Before reuse, all forms shall be thoroughly scraped, cleaned, nails removed, holes that may leak suitably plugged and joints examined and when necessary repaired and the inside retreated to prevent adhesion, to the satisfaction of Engineer-in-charge. Warped lumber shall be resized. Contractor shall equip himself with enough shuttering to complete the job in the stipulated time.

3.11 REMOVAL OF FORMS :

Contractors shall record on the drawings or a special register, the date upon which the concrete is placed in each part of the work and the date on which the shuttering is removed there from.

In no circumstances shall forms be struck until the concrete reaches a strength of the at least twice the stress due to self weight and any construction erection loading to which the concrete may be subjected at the time of striking formwork.

In normal circumstances (generally where temperatures are above 15 ^{0}C.) forms may be struck after expiry of the following periods :

Stripping time:

Sl.No.	Type of form work	Minimum period before
a)	Vertical form work to columns, walls beams	16 – 24 h
b)	Soffit form work to slabs (Props to be refixed immediately after removal of formwork)	3 days

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c)	Soffit form work to beams (Props to be refixed immediately after removal of formwork	7 days
d)	Props to slabs: 1) Spanning up to 4.5 m 2) Spanning over 4.5 m	 7 days 14 days
e)	Props to beams and arches; 1) spanning up to 6 m 2) spanning over 6 m	 14 days 21 days

For other cements and lower temperature, the stripping time recommended above may be suitably modified.

The number of props left under the sizes and the position shall be such as to able to safey carry the full dead load of the slab, beam or arch., as the case may be together with any live load likely to occur during curing or further constructions.

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

Striking shall be done slowly with utmost care to avoid damage to arise and projection and without shock or vibration, by gently easing the wedges. If after removing the formwork, it is found that timber has been embedded in the concrete, it shall be removed and made good as specified earlier.

Reinforced temporary openings shall be provided, as directed by Engineer-in-Charge, to facilitate removal of formwork which otherwise may be in-accessible.

Tie rods, clamps, form bolts etc. which must be entirely removed from walls or similar structures shall be loosened not sooner than 24 hours nor later than 40 hours after concrete has been deposited. Ties, except those required to hold forms in place, may be removed at the same time. Ties withdrawn from walls and grade beams shall be pulled towards the inside face. Cutting ties back from the faces of walls and grade beams will not be permitted. Work damaged due to premature or careless removal of forms shall be re-constructed at contractors cost.

3.12 MODE OF MEASUREMENT :

In case the items of concreting are inclusive of cost of form work, no separate measurements shall be taken for form work. However, if the form work is to be paid separately and the item exists in the Schedule of Quantities for various types of form work, the net area of exposed surface of concrete members as shown in drawings coming in contact with form work shall be measured under item of formwork in square meters.

All temporary formwork such as bulk heads, stop boards provided at construction joints which are not shown in the drawings shall not be measured.

No deductions shall be made for openings/ obstructions upto an area of 0.1 sqm. and nothing extra shall be paid for forming such openings.

The rate shall include the cost of erecting, centering, shuttering materials, transport, deshuttering and removal of materials from site and labour required for all such operations etc.

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4. STEEL FOR CONCRETE REINFORCEMENT :

4.1 SCOPE OF MATERIAL:

The contractor shall make his own arrangement for procurement of Reinforcement steel bars and wires for use in Reinforced Cement Concrete works. Unless otherwise specified in drawings / Schedule of quantities, the steel bars shall be of "High strength deformed steel bars and wires" conforming to the IS 1786 (latest revision), in the following strength grades:

a) Fe 415, Fe 415D;

b) Fe 500, Fe 500D;

c) Fe 550, Fe 550D;

and d) Fe 600.

Where **"Fe"** stands for specified minimum 0.2% proof / yield stress in N/mm^2 and **"D"** stands for same specified minimum 0.2% proof / yield stress but with enhanced specified minimum percentage elongation.

4.2 TERMINOLOGY:

Elongation: The increase in length of a tensile test piece under stress, expressed as a percentage of the original gauge of a standard piece.

Longitudinal Rib -A uniform continuous protrusion, parallel to the axis of the bar/wire (before cold-working, if any).

Nominal Diameter or Size- The diameter of a plain round bar/wire having the same mass per metre length as the deformed bar/wire.

Nominal Mass -The mass of the bar/wire of nominal diameter and of density 0.00785 kg/cumm per meter.

Nominal Perimeter - 3.14 times the nominal diameter of a deformed bar/Wire.

Percent Proof Stress -The stress at which a non-proportional elongation equal to 0.2% of the original gauge length takes place.

Uniform elongation - The elongation corresponding to the maximum load reached in a tensile test (also termed as percentage total elongation at maximum force).

Tensile Strength - The maximum load reached in a tensile test divided by the effective cross-sectional area of the gauge length portion of the test piece (also termed as ultirnate tensile stress).

Transverse Rib - Any rib on the surface of a bar/wire other than a longitudinal rib.

Yield Stress - Stress (that is, load per unit cross sectional area) at which elongation first occurs in the test piece without increasing the load during the tensile test. In the case of steels with no such definite yield point, proof stress shall be applicable.

The high strength deformed steel bars and wires for concrete reinforcement shall be hot rolled steel without subsequent treatment or hot rolled steel with controlled cooling and tempering and cold worked steel, and reinforcing bars and wires which may be subsequently coated.

Steel bars shall be supplied from M/s. Steel Authority of India Ltd. (SAIL) or M/s. TATA Steel (TISCO) or M/s. Rashtriya Ispat Nigam Ltd (RINL) or M/s. Indian Iron & Steel Co. (IISCO) Ltd., from their own plants rolled from virgin material, and shall be procured directly or from their authorised dealers and not from re-rollers or conversion agents. The contractor shall supply copy of Documentary evidence of purchase of steel from the specified manufacturers.

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4.3 TESTS:

The contractor shall submit the test certificate of manufacturer. Regular tests on steel supplied by the contractor shall be performed by the contractor at the approved lab, in presence of the Departmental Engineers as per relevant Indian Standards. Engineer-in-charge may require Contractor to perform necessary tests of samples at random as per relevant B.I.S. All cost of such tests and incidentals to such tests shall be borne by the Contractor. The quality, grade, colour coding embossing marks etc. all shall be to the entire satisfaction of the Engineer-in-Charge. Steel not conforming to above test criteria shall be rejected.

The Chemical, Physical & Mechanical properties of the steel reinforcement bars shall be as per IS 1786. Unless otherwise specified, Selection and Preparation of Test Sample shall be as per the requirements of IS 2062.

All test pieces shall be selected either from the cuttings of bars / wires; or from any bar/wire after it has been cut to the required or specified size and the test piece taken from any part of it. In neither case, the test piece shall be detached from the bar/wire except in the presence of the EIC or his authorized representative.

The test pieces shall be full sections of the bars/wires and shall be subjected to physical tests without any further modifications. No reduction in size by machining or otherwise shall be permissible, except in case of bars of size 28 mm and above. No test piece shall be annealed or otherwise subjected to heat treatment. Any straightening which a test piece may require shall be done cold.

For the purpose of carrying out tests for tensile strength, proof stress, percentage elongation and percentage elongation at maximum force for bars 28 mm in diameter and above, deformations of the bars only may be machined. For such bars, the physical properties shall be calculated using the actual area obtained after machining. The following IS codes shall be referred for test methods:

SN	Title	IS No	ISO No.
i	Mechanical testing of metals -Tensile testing	1608	6892
ii	Methods for bend test	1599 7438 & 1786	15630-1
iii	Method for re-bend test for metallic wires & bars	1786	15630-1

THE PROPERTIES AS PER IS 1786 – 2008 ARE REPRODUCED BELOW:

Chemical Composition of the bars shall conform to the following requirement:

Constituents	Maximum Permissible Percent							Permissible max. Variation
	Fe 415	Fe 415D	Fe 500	Fe 500D	Fe 550	Fe 550D	Fe 600	
Carbon	0.30	0.25	0.30	0.25	0.30	0.25	0.30	0.020
Sulphur	0.06	0.04	0.05	0.04	0.05	0.04	0.04	0.005
Phosphorus	0.06	0.04	0.05	0.04	0.05	0.04	0.04	0.005
Sulphur & Phosphorus	0.110	0.085	0.105	0.075	0.100	0.075	0.075	0.010 %

Notes:

i) For welding of deformed bars, the recommendations of IS 9417 shall be followed.

ii) In case of deviations from the specified maximum, two additional test samples shall be taken from the same batch and subjected to the test or tests in which the original sample failed. Should both additional test samples pass the test, the batch from which they were taken shall be deemed to comply with this standard. Should either of them fail, the batch shall be deemed not to comply with this standard

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Mechanical Properties of High Strength Deformed Bars and Wires

Sl. No	Property	Maximum Permissible Percent						
		Fe 415	Fe 415D	Fe 500	Fe 500D	Fe 550	Fe 550D	Fe 600
1	2	3	4	5	6	7	8	9
i	0.2 percent proof stress / yield stress, Min, N/mm2	415.0	415.0		500.0	550.0	550.0	600.0
ii	Elongation, percent, Min. on gauge length 5.65 √A, where A	14.5	18.0	12.0	16.0	10.0	14.5	10.0
iii	Tensile strength, Min	10% more than the actual 0.2% proof stress/yield stress but not	12% more than the actual 0.2% proof stress/yield stress but not	8% more than the actual 0.2% proof stress/yield	10% more than the actual 0.2% proof stress/yield stress but not	6% more than the actual 0.2% proof stress/yield	8% more than the actual 0.2% proof stress/yield stress	6% more than the actual 0.2% proof stress/yield
iv	Total elongation at maximum force, percent, Min of gauge length 5.65 √A, where	-	5	-	5	-	5	-

Note: To satisfy Clause 26 of IS 456 -2000, no mixing of different types of grades of bars shall be allowed in the same structural members as main reinforcement, without prior written approval of the Engineer-in-Charge.

4.4 STACKING & STORAGE :

Steel for reinforcement shall be stored in such a way as to prevent distorting and corrosion. The steel for reinforcement shall not be kept in direct contact with ground. Fresh / Fabricated reinforcement shall be carefully stored to prevent damage, distortion, corrosion and deteriorations. Care shall be taken to protect steel from exposure to saline atmosphere during storage, fabrication and use. It may be achieved by treating the surface of reinforcement with cement wash or by suitable methods. Bars of different classifications, sizes and lengths shall be stored separately to facilitate issue in such sizes and lengths to cause minimum wastage in cutting from standard length.

4.5 QUALITY :

Steel not conforming to specifications shall be rejected. All reinforcement shall be clean, free from grease, oil, paint, dirt, loose mill, scale, loose rust, dust, bituminous material or any other substances that will destroy or reduce the bond. All rods shall be thoroughly cleaned before being fabricated. Pitted and defective rods shall not be used. All bars shall be rigidly held in position before concreting. No welding of rods to obtain continuity shall be allowed unless approved by the Engineer-in-Charge. If welding is approved, the work shall be carried as per I.S. 2751, according to best modern practices and as directed by the Engineer-in-Charge. In all cases of important connections, tests shall be made to prove that the joints are of the full strength of bars welded. Substitution of reinforcement will not be permitted except upon written approval from Engineer-in-charge.

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4.6 NOMINAL SIZES

The nominal sizes of bars/wires shall be 4mrn, 5mrn, 6mrn, 8mrn, 10mrn, 12mrn, 16mrn, 20mrn, 25 mm, 28mrn, 32mrn,
36mrn, 40 mm. (Other sizes viz. 7mrn, 18mrn, 22 mm, 45 mm and 50 mm may be procured on specific stipulations).

4.7 NOMINAL MASS

For the purpose of checking the nominal mass, the density of steel shall be taken as 0.00785 kg/mm^3 of the cross- sectional area per metre. Unless otherwise specified, the tolerances on nominal mass shall be as per following Table.

Tolerances on Nominal Mass

SN	Nominal Size in mm	Tolerance on the nominal mass in		
		Batch	Individu al	Individual sample for
1	2	3	4	5
i)	Up to and including 10	± 7	- 8	± 8
ii)	Over 10 up to and including	± 5	- 6	± 6
iii)	Over 16	± 3	- 4	± 4

4.8 LAPS :

Laps and splices for reinforcement shall be shown on the drawings. Splices in adjacent bars shall be staggered and the locations of all splices, except those specified on the drawings, shall be approved by the Engineer-in-Charge. The bars shall not be lapped unless the length required exceeds the maximum available lengths of bars at site.

4.9 BENDING :

All bars shall be accurately bent according to the sizes and shapes shown on the detailed working drawing / bar bending schedules. They shall be bent gradually by machine or other approved means. Reinforcing bars shall not be straightened and re-bent in a manner that will injure the materials. Bars containing cracks or splits shall be rejected. They shall be bent cold, except bars of over 25 mm. in diameter which may be bent hot if specifically approved by the Engineer-in-Charge. Bars that depend for their strength on cold working shall not be bent hot. Bars
bent hot shall not be heated beyond cherry red colour (not exceeding 645^{0}C) and after bending shall be allowed to
cool slowly with out quenching. Bars incorrectly bent shall be used only after straightening and re-bending be such as shall not, in the opinion of the Engineer-in-Charge, injure the material. No reinforcement bar shall be bent when in position in the work without approval, whether or not it is partially embedded in hardened concrete. Bars having kinks or bends other than those required by design shall not be used.

BENDING AT CONSTRUCTION JOINTS :

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

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4.10 FIXING / PLACING AND TOLERANCE ON PLACING :

Reinforcement shall be accurately fixed by any approved means maintained in the correct position as shown in the drawings by the use of blocks, spacers and chairs as per I.S. 2502 to prevent displacement during placing and compaction of concrete. Bars intended to be in contact at crossing point shall be securely bound together at all such points with number 16 gauge annealed soft iron wire. The vertical distances required between successive layers of bars in beams or similar members shall be maintained by the provision of spacer bars at such intervals that the main bars do not perceptibly sag between adjacent spacer bars.

TOLERANCE ON PLACING OF REINFORCEMENT :

Unless otherwise specified, reinforcement shall be placed within the

	Tolerance in spacing
a) For effective depth, 200 mm or less	+ /- 10 mm
b) For effective depth, more than 200 following tolerances : mm	+ /- 15 mm

4.11 COVER TO REINFORCEMENT :

Nominal cover is the design depth of concrete cover to all steel reinforcements, including links. It is the dimension used in design and indicated in the drawings. It shall be not less than the diameter of the bar. Unless otherwise specified, cover to reinforcement shall be provided generally as per guidelines of IS 456.

Nominal cover to meet durability requirement:

Minimum values for the nominal cover of normal weight aggregate concrete which should be provided to all reinforcement, including links depending on the condition of exposure described in 4.4 above and as per (nominal cover to meet durability requirements).

However for a longitudinal reinforcing bar in a column nominal cover shall in any case not be less than 40 mm or less than the diameter of such bar. In the case of columns of minimum dimension of 200 mm or under, whose reinforcing bar do not exceed 12 mm , a nominal cover of 25 mm may be used.

For footings minimum cover shall be 50 mm.

Nominal cover to meet specified period of fire resistance

Minimum values of nominal cover of normal-weight aggregate concrete to be provided to all reinforcement including links to meet specified period of the resistance as per the tables given under clause 4.4.1 of this specifications.

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

Unless indicated otherwise on the drawings, clear concrete cover for reinforcement (exclusive of plaster or other decorative finish shall be as follows:

a) At each end of reinforcing bar not less than 25mm., nor less than twice the diameter of such, bar.

b) For a longitudinal reinforcing bar not less than 25 mm., nor more than 40 mm., nor less than the diameter of such bar. In the case of column of maximum dimensions of 200 mm. or under, whose reinforcing bars do not exceed12 mm., a cover of 25 mm. may be used.

c) For longitudinal reinforcing bar in a beam, not less than 25mm., nor less than diameter of such bar.

d) For tensile, compressive, shear, or other reinforcement in a slab, not less than 25 mm, nor less than the diameter of such bar, and

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e) For any other reinforcement not less than 15 mm., nor less than the diameter of such bar.

f) Increased cover thickness may be provided when surfaces of concrete members are exposed to the action of harmful chemicals (as in the case of concrete in contact with earth faces contaminated with such chemicals), acid, vapour, saline atmosphere, sulphurous smoke (as in the case of steam-operated railways) etc. and such increase of cover may be between 15 mm. and 50 mm. beyond the figures given in (a to e) above as may be specified by the Engineer-in-Charge.

g) For reinforced concrete members, totally immersed in sea water, the cover shall be 40 mm. more than specified (a to e) above.

h) For reinforced concrete members, periodically immersed in sea water or subject to sea spray, the cover of concrete shall be 50 mm. more than that specified (a to e) above.

i) For concrete of grade M 25 and above, the additional thickness of cover specified in (f), (g) and (h) above may be reduced to half. In all such cases the cover should not exceed 75 mm.

j) Protection to reinforcement in case of concrete exposed to harmful surroundings may also be given by providing dense impermeable concrete with approved protective coating, as specified on the drawings. In such case the extra cover, mentioned in (h) and (i) above, may be reduced by the Engineer-in-Charge, to those shown on the drawing.

k) The correct cover shall be maintained by cement mortar briquettes or other approved means. Reinforcement for footings, grade beams and slabs on subgrade shall be supported on precast concrete blocks as approved by the Engineer-in-Charge. The use of pebbles or stones shall not be permitted.

l) The minimum clear distance between reinforcing bars shall be in accordance with I.S. 456 or as shown in drawing.

4.12 THE BARS SHALL BE KEPT IN CORRECT POSITION BY THE FOLLOWING METHODS.

a) In case of beam and slab construction precast cover blocks in cement mortar 1:2 (1 cement : 2 coarse sand) about 4 x 4 cm section and of thickness equal to the specified cover shall be placed between the bars and shuttering, so as to secure and maintain the requisite cover of concrete over reinforcement.

b) In case of cantilevered and doubly reinforced beams or slabs, the vertical distance between the horizontal bars shall be maintained by introducing chairs, spacers or support bars of steel at 1.0 metre or at shorter spacing to avoid sagging.

c) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them; or with block of cement mortar 1:2 (1 cement : 2 coarse sand) of required size suitably tied to the reinforcement to ensure that they are in correct position during concreting.

d) In case of other R.C.C. structure such as arches, domes, shells, storage tanks etc. a combination of cover blocks, spacers and templates shall be used as directed by Engineer-in-Charge.

4.13 INSPECTION :

Erected and secured reinforcement shall be inspected and approved by Engineer-in-Charge prior to placement of concrete.

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4.14 MODE OF MEASUREMENT FOR REINFORCEMENT FOR R.C.C. WORKS :

Reinforcement as detailed in schedule of quantities shall be measured for payment lineally as per the cutting length nearest to a centimetre shown in bar bending schedule submitted by the contractor and approved by the Engineer-in- Charge and weight calculated based on the standard weights as per I.S.1786, as indicated in the following table:

Nominal size in mm	**6**	**7**	**8**	**10**	**12**	**16**	**18**	**20**
Cross Sectional area in mm^2.	28.30	38.50	50.30	78.60	113.10	201.20	254. 60	314.30
Mass / Weight in Kg /	0.222	0.302	0.395	0.617	0.888	1.580	2 .000	2 .47
Nominal size in mm	**22**	**25**	**28**	**32**	**36**	**40**	**45**	**50**
Cross Sectional area in mm^2	380.30	491.10	614.00	804.60	1018.30	1257.20	1591.10	1964.30
Mass / Weight in Kg /	2 .980	3.850	4.830	6.310	7.990	9.850	12.500	15.420

No allowance shall be made/ be measured in the weight for rolling margin. If weight of bar(s) found to be more than the standard weights, the measurement / payment shall be restricted to the standard weights as above. However, if weight of bar(s) found to be less than the standard weights (but within the permissible limit), the measurements / payment for the same shall be as per standard weights.

Only authorised laps shall be measured. The cost of steel used by the contractor in the reinforcement of beams, slabs and columns etc. will be paid as per the rate of reinforcement only upto the extent shown in the drawings. As far as possible laps in bars shall be avoided. Any laps and hooks provided by the contractor other than authorised as per approved bar bending schedule will be considered to have been provided by the contractor for his own convenience and shall not be measured for payment. Pins, chairs, spacers shall be provided by the contractor wherever required as per drawing and bar bending schedule and as directed by the Engineer-in-Charge and shall be measured for payment. Fan hooks as required shall be provided by the contractor under this item and shall be measured for payment.

The rate shall include the cost of all materials and labour required for all above operations including transport, wastage, straightening, cutting, bending, binding and the binding wire required.

5. STRUCTURAL STEEL :

5.1 SCOPE OF WORK :

The work covered by this specification consists of furnishing and erecting of structural steel complete in strict accordance with this specifications and the applicable drawings.

5.2 MATERIALS :

5.2.1 All structural steel shall be of standard sections as marked on the drawings and shall be free of scale, blisters, laminations, cracked edges and defects of any sort. If the structural steel is not supplied by the Department and the Contractor is required to bring such steel, the Contractor shall furnish duplicate copies of all mill orders and/ or also the test

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report received from the mills, to satisfy the Engineer-in-Charge.

5.2.2 All structural steel and electrodes shall comply in all respects with I.S.S. for structural steel.

5.3 WORKMANSHIP :

All workmanship shall be of first class quality in every respect to the greatest accuracy being observed to ensure that all parts will fit together properly on erection.

All ends shall be cut true to planes. They must fit the abutting

surfaces closely. All stiffeners shall be fit tightly at both ends.

All butt ends of compression members shall be in close contact through the area of the joints.

All holes in plates and section between 5 mm. and 20 mm. thick shall be punched to such diameter that 3 mm. of metal is left all around the hole to be cleaned out to correct size by reamer.The base connection shall be provided as shown on drawings and the greatest accuracy of workmanship shall be ensured to provide the best connections.Figured dimensions on the drawings shall be taken.

5.4 ERECTION AND MARKING :

Erection and fabrication shall be according to I.S. 800-1984 section-11. During erection, the work shall be securely braced and fastened temporarily to provide safety for all erection stresses etc. No permanent welding shall be done until proper alignment has been obtained.

Any part which do not fit accurately or which are not in accordance with the drawings and specifications shall be liable to rejection and if rejected, shall be at once be made good.

Engineer-in-Charge shall have full liberty at all reasonable times to enter the contractors premises for the purpose of inspecting the work and no work shall be taken down, painted or despatched until it has been inspected and passed. The contractor shall supply free of charge all labour and tools required for testing of work.

5.5 DELIVERY AT SITE :

The contractor shall deliver the component parts of the steel work in an undamaged state at the site of the works and the Engineer-in-Charge shall be entitled to refuse acceptance of any portion which has been bent or other wise damaged before actual delivery on work.

5.6 SHOP DRAWINGS :

The shop drawings of structural steel based on contract drawings shall be submitted to the Engineer-in- Charge. The necessary information for fabrication, erection, painting of structure etc. must be furnished immediately after acceptance of the tender.

5.7 PAINTING :

Painting should be strictly according to I.S. 1477-1971 (PartI-Pretreatment) and I.S. 1477-1971 (Part II-painting). Painting should be carried out on dry surfaces free from dust, scale etc. The paint shall be approved by theEngineer-in-Charge.One coat of shop paint (red lead) shall be applied on steel, except where it is to be encased in concrete or where surfaces are to be field welded.

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5.8 WELDING :

Welding shall be in accordance with I.S. 816-1969, I.S. 819-1957, I.S. 1024-1979, I.S. 561-1959, I.S. 1323-1982 and I.S. 9595-1980 as appropriate. For welding of any particular type of joint, welders shall give evidence of having satisfactory completed appropriate tests as described in any of I.S. 817-1966, I.S. 1393-1961, I.S. 7307 (Part-I)-1974, I.S. 7310 (Part-I)-1974 and I.S. 7318 (Part-I)-1974 as relevant.

5.8.1 Welding Consumables : Covered electrodes shall conform to I.S. 814 (Part-I)-1974 and I.S.814 (Part-II)-1974 or I.S. 1395-1982 as appropriate.

Filler rods and wires for gas welding shall conform to I.S. 578-1972.

The bare wire electrodes for submerged arc welding shall conform to I.S. 7280-1974. The combination of arc and flash shall satisfy the requirements of I.S. 3613-1974.

The filler rods and bare electrodes for gas shielded metal, arc welding shall conform to I.S. 6419-1971 and I.S.6560-1972 as appropriate.

5.8.2 Types of Welding: Arc welding (direct or alternating current) or Oxyacetylene welding may be used. Field welding may be used. Field welding shall be by D.C.

5.8.3 Size of Electrode Runs: The maximum gauge of the electrodes for welding any work and the size of run shall be based on the following tables.

Average thickness of plate or	**Maximum gauge or diameter of electrodes to**
Less than 3/16"	10 S.W.G.
3/16" and above but less than	8 S.W.G.
5/16" and above but less than	6 S.W.G.
3/8" and above but less than 5/8"	4 S.W.G.
5/8" and above but less than 1"	5/16"dia.
1" and above thick section	3/8" dia.

Note : On any straight weld the first run shall not ordinarily be deposited with a larger gauge electrode than No.
8 S.W.G. For subsequent runs the electrode shall not be increased by more than two electrode size between consecutive runs.

5.8.4 Welding Contractors : The contractor shall ensure that each welding operator employed on fabrication or erection is an efficient and dependable welder, who has passed qualifying tests on the types of welds which will be called upon to make. Sample test shall have to be given by the contractor to the entire satisfaction of the Engineer-in-charge.

5.8.5 Welding Procedure :

a) Welding should be done with the structural steel in flat position in a down hand manner wherever possible. Adequate steps shall be taken to maintain the correct arc length, rate of travel, current and polarity for the type of electrode and nature of work. Welding plant capacity shall be adequate to carry out the welding procedure laid down. Adequate means of measuring the current shall be available either as a part of the welding plant or by the provision of a portable ammeter. In checking the welding current, a tolerance of 10% or 30 amperes from the specified value whichever is less shall be permitted.

c) The welding procedure shall be such as to ensure that the weld metal can be fully and satisfactory deposited through the length and thickness of all joints so that distortion and shrinkage stresses are reduced to the minimum and thickness of welds meet the requirements of quality specified.

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5.9 WORKMANSHIP :

5.9.1 Preparation of Fusion Faces : Fusion faces shall be cut by stearing machine or gas cutting and later dressed by filling or grinding so that they shall be free from irregularities such as would interfere with the deposition of the specified size of weld to cause the defects. Fusion faces and the surrounding surfaces shall be free from heavy slag, oil paint or any substance which might affect the quality of the weld or impede the progress of welding. The welding face shall be free of rust and shall have metal shine surfaces.

The parts to be welded shall be brought into as close contact as possible and the gap due to faulty workmanship or incorrect fit up shall not exceed 1/16". If separation of 1/16" or more occurs locally, the size of the fillet weld shall be increased at such position by an amount of equal to the width of the gap.

The parts to be welded shall be maintained to their correct position during welding. They shall be securely held in position by means of tack welds, service bolts, clamps or rings before commencing welding so as to prevent and relative movement due to distortion, wind or any other cause.

5.9.2 Step Back Method Should be Used to Avoid Distortion : The minimum leg length of a fillet weld as deposited should not be less than the specified size and the throat thickness as deposited should be not less than that tabulated below:

Throat Thickness of Fillet

Angle between fusion	60^0-90^0	91^0-	101^0-	107^0-	114^0-
Throat thickness in cms.	0.70	0.65	0.60	0.55	0.50

In no case should a concave weld be deposited without the specific approval of the Engineer-in-Charge unless the leg length is increased above the specified length so that the resultant throat thickness is as great as would have been obtained by the deposition of a flat.

All welds shall be deposited in a pre-arranged order and sequence taking due account of the effects of distortion and shrinkage stresses.

After making each run of welding, all slag shall be removed and final run shall be protected by clean boiled linseed oil till approved.

The weld metal, as deposited, shall be free from crack, slag,excessive porosity, cavities and other faults.

The weld metal shall be properly fused with the parent metal without overlapping or serious undercutting at the toes of the weld.

The surfaces of the weld shall have a uniform and consistent contour and regular appearance.

In welds containing crack, porosity or cavities in which the weld metal tends to overlap on the parent metal without proper fusion, the defective portions of the welds shall be out cut and re-welded. Where serious under cutting occurs, additional weld metal shall be deposited to make good reduction. Testing of welded joints shall be done as per relevant IS codes 3600, 3613, 4260, 7205, 7215, 7307, 7310, 7318.

5.10 MODE OF MEASUREMENT:

All structural steel shall be measured on weight basis in metric tonnes or quintals or kgs. as mentioned in the schedule of quantities. The length or areas of various members including gusset plates shall be measured correct to two places of decimals and the net weight worked out from the standard steel tables approved by Indian Standard Institution. No

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separate measurements shall be taken for welding, riveting, bolting, field connections etc. The rate shall include cost of all labour, materials, scaffolding, transport and also cost of welding, riveting and bolting, field connections if any all to complete the job as per specifications.

6. BRICK WORK :

6.1 SCOPE OF WORK : The work covered under this specification pertains to procurement of well burnt clay bricks of class 35 unless otherwise specified and workmanship in building walls of various thickness, in strict compliance with the specifications and applicable drawings.

6.2 MATERIALS: Brick shall be well burnt clay bricks of designated class and shall satisfy the strength criteria and shall be got approved by the Engineer-in-Charge before incorporation in the work. The bricks shall be hand moulded or machine moulded and shall be free from nodules of free lime, visible cracks, flaws, warpage and organic matter.

In general, the nominal size of bricks (F.P.S.) shall be 22.9 x 11.4 x 7 cm. (9”x4.5”x2.75”). Permissible tolerance on dimensions shall not be more than (+/-) 8%. The contractor shall get approved the sample and source of bricks from Engineer-in-Charge before procurement on large scale and shall maintain the same for the entire work. The bricks shall have smooth rectangular faces with sharp corner and shall be uniform in colour.

Bricks for Mumbai / Pune and surrounding areas, unless otherwise specified, shall be as per relevant IS of class designation 35 of size 22.5 x 11.1 x 7 cm. Permissible tolerance on dimensions shall not be more than (+/-) 8%.

Unless otherwise specified, bricks for Eastern Zone works (Kolkata / Bhubneshwar / Shillong etc.) shall be of class designation 75 of size 25 x 5.5 x 7.5 cm. Permissible tolerance on dimensions shall be as per relevant IS.

In case the size of bricks used in the work is found lesser than the specified one but within the permissible tolerance i.e. {-} 8% , the following shall apply:

i) Extra cement consumed due to more number of joints and due to additional thickness of plaster than the specified in the tender to match with adjoining columns and beams, shall be borne by the contractor without any extra cost to the department.

ii) If the plastering to be done is more than the specified thickness to maintain the plaster surface to perfect line, level and plumb with adjoining columns, beams, walls etc., the contractor shall be responsible to provide more thickness of plaster at his own cost and nothing extra will be paid on this account.

In case the size of bricks used in the work is found more than the permissible, the contractor shall chip out the exposed edges of bricks upto the required level of wall to receive specified thickness of plaster.

Bricks shall generally conform to I.S. 1077-1992. In any case minimum crushing strength shall not be less than 35 kg/cm2 and water absorption shall not be more than 25% by weight. The Engineer-in-Charge shall have the right to reject bricks obtained from any field where the soil has an appreciable quantity of sulphates and chlorides. The specifications for cement, sand and water shall be same as described herein before under cement concrete. Bricks shall be thoroughly soaked in water before using till the bubbles ceases to come up. No half or quarter brick shall be used except as closer. The closer shall be cut to required size and used near the end of the walls. The walls shall be raised truly to plumb. The type of bond to be adopted shall be decided by the Engineer-in-Charge, but vertical joints shall be laid staggered.

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6.3 WORKMANSHIP : Four courses of brick work with four joints should not exceed by more than 40 mm., the same bricks piled one over the other without mortar.

Brick work shall not be raised more than 10 courses a day unless otherwise approved by the Engineer-in-Charge. The brick work shall be kept wet for at least 7 days. Brick work shall be uniformly raised alround and no part shall be raised more than 1.0 metre above another at any time.

All joints shall be thoroughly flushed with mortar of mix as specified in the schedule of quantities, at every courses. Care shall be taken to see that the bricks are bedded effectively and all joints completely filled to the full depth.

The joints of brick work to be plastered shall be raked out to a depth not less than 10 mm. as the work proceeds. The surface of brick work shall be cleaned down and watered properly before the mortar sets.

The adhesion between the brick masonry surface and the concrete surface of columns, beams, chajjas, lintels etc. should be proper by ensuring that the concrete surface coming in contact with brick masonry is hacked/ chipped/ keyed, cleaned and cement slurry is applied so that a proper bond is achieved between the two dissimilar materials. It is the responsibility of the contractors to ensure that there will not be any cracks/ fissures anywhere in the brick masonry.

In case the cracks appear subsequently in those areas, they should be made good by cement grouting or epoxy putty grouting/ poly sulphide compound grouting or as per standard modern specifications/ methods with the prior approval of the Engineer-in-Charge, at the cost of the contractor.

All the courses shall be laid truly horizontal and all vertical joints shall be truly vertical. Specified mortar of good and approved quality shall be used. Lime shall not be used where reinforcement is provided in brick work. The mortar should completely cover the bed and sides of the bricks. Proper care should be taken to obtain uniform mortar joint throughout the construction. the walls should be raised uniformly in proper, approved bond. In construction of the wall, first of all two end corners are carefully laid to line and level and then in between portion is built, with a cord stretching along the headers or stretchers held in position at the ends. This helps in keeping the alignment of the courses and maintaining them in level. Similarly all other courses are built. Care shall be taken to keep the perpends properly aligned within following maximum permissible tolerances :

a) Deviation from vertical within a storey shall not exceed 6 mm per 3 m height.

b) Deviation in verticality in total height of any wall of building more than one storey in height shall not exceed 5.5mm. c) Deviation from position shown on plan of any brick work shall not exceed 5.5 mm.

d) Relative displacement between load bearing wall in adjacent storeys intended to be vertical alignments shall not exceed 6 mm.

e) A set of tools comprising of wooden straight edge, masonic spirit levels, square, 1 meter rule line and plumb shall be kept on the site of work for every 3 masons for proper check during the progress of work.

No brick work shall be carried on during frosty weather except with the written permission of the Engineer-in- Charge, who will give special directions as to the manner in which the work is to be performed. All brick work laid during the day, shall, in seasons liable to frost, be properly covered up at night as directed by the Engineer-in- charge. Should any brick work be damaged by frost, the brick work shall, at the discretion of the Engineer-in- Charge, be

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pulled down and made good, at the cost of the contractor.

Concrete surfaces of columns, beams, lintels, chajjas etc. coming in contact with masonry work shall be properly chipped, washed and given a thick coat of cement slurry before start of work. The rate quoted shall include wire brushing and cleaning brickwork covered with fungus or deleterious materials.

Brick work shall be well watered/ cured throughout the day for at least a week from the date of building and the work shall be protected from sun and rain.

HALF BRICK WORK:

Materials and workmanship for a half brick or brick on edge partition wall shall be as specified above. The wall shall be stiffened by R.C.C. stiffeners of size 115 mm. wide x 80 mm. thickness to the full length of wall and shall be provided with 2 Nos. 6 mm. diameter M.S. bars or as specified in the schedule as bottom reinforcement (only the M.S. reinforcement will be paid separately under relevant item). These bars shall be securely anchored at their end where the partition end. The free ends of the reinforcement shall be keyed into the mortar of the main brick work to which the half brick work is joined. Overlaps in reinforcement, if any, shall not be less than 30 cm.

The rates for brick work shall include the cost of the following:

i) Providing and fixing necessary single or double scaffolding and removing the same after the work is completed.

ii) Form work for stiffeners concrete as required.

iii) Watering, curing, lifting of materials to

any height. iv) Raking out of joints to

receive plaster.

v) Forming slab sittings, cutting or leaving holes for lugs of windows, doors, sills, switch boxes etc.

vi) Making good all holes, chases, etc. to any depth due to conduit pipes, holdfasts, bolts,

switch & plug boxes etc. vii) Bedding and pointing precast lintels, sills etc. in or on walls.

For the purpose of measurements, the thickness of one brick wall and over shall be taken in terms of multiples of half brick.

6.4 SAMPLING AND TESTS:

Samples of bricks shall be subjected to the following mandatory tests :

a) Dimensional tolerance b) Water absorption c) Efflorescence d) Compressive strength

Note : 1. Cost of above tests shall be borne by the contractor.

2. Frequency of test shall be as per relevant IS specifications.

6.5 MODE OF MEASUREMENT :

6.5 a) For Brick Work Measured in Cubic Metres :

The contract rate shall be for a unit of one cubic metre of brick masonry as actually done.

230 mm. thick (or as specified in schedule) brick walls shall be taken as one brick thick.

All openings in brick work for doors, windows and ventilators shall be deducted to get the net quantity of actual brick work done.

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Openings or chases required for P.H. or electrical inserts less than 0.1 sqm. and bearing of precast concrete members shall not be deducted.

No extra payment shall be made for any extra work involved in making the above openings or placements.

6.5 b) For brick work measured in square metre :

Half brick thick masonry walls shall be measured in sqm. All openings in brick work for doors and windows and ventilators shall be deducted to get the net quantity of actual work done. Openings or chases required for P.H. or Electric inserts less than 0.1 sqm. and bearing of precast concrete members shall not be deducted. No extra payment shall be made for extra work involved in making the above openings or placements.

7. STONE MASONRY :

7.1 SCOPE OF WORK :

The work covered under this specifications consists of supplying and erecting stone masonry walls with available best quality of stone in strict compliance with this specifications and applicable drawings.

7.2 RANDOM RUBBLE MASONRY :

7.2.1 Material : The rubble shall be of the best quality trap/granite/ballast stones obtained from the approved quarry. The sample of the stone, to be used shall be got approved from the Engineer-in-Charge. All stones shall, generally, be freshly quarried and shall be sound, dense, hard, free from segregation, cracks, weathered portions and other structural defects or imperfections, tending to off set soundness and strength. The percentage of water absorption shall generally not exceed 5% by weight. All stones shall be wetted before use. Stones shall be neatly worked to requisite sections and forms and shall have fully dressed beds and joints. At least 50% of the stones shall be 0.015 cum in content when reckoned individually. The length of stones for stone masonry shall not exceed three times the height and the breadth or base shall not be greater than three fourth the thickness of wall, or not less than 15 cm. The height of stone may be upto 30 cm. Stones shall be laid on the natural beds and shall run sufficiently inside the wall thickness. No hollow space shall be left out and inter spaces of stones being filled with mortar and stone chips, driven hard & not with mortar only.

All mortar to be used shall be of the type and proportion mentioned in the item. Cement, sand and water to be used shall conform to their relevant specifications as described under cement concrete. The masonry shall be laid to plumb, lines levels, curves, shapes as shown in drawings. All required holes for passage of water or pipes are to be embedded during construction as specified.

All stones shall be wetted before laying in masonry. Concrete surfaces of columns, beams, lintels, chajjas etc. coming in contact with masonry shall be properly chipped, washed and wetted before start of masonry work. The concrete surface coming in contact of masonry shall be given a thick coat of cement slurry as the masonry work progresses in height. Clean chips and sprawls carefully selected to fit in the space shall be wedged into the mortar joints and beds wherever necessary to avoid thick beds or joints or mortar. However, proper shaping and dressing of stones shall be done prior to their laying in masonry and hammering shall not be resorted to often after the stones are laid in position. The bond stones shall be used in every square meter area of masonry wall and shall extend from front to back to thin walls having width of 600mm and shall overlap by at least 150mm in walls having thickness more than 600mm when laid from both sides. Engineer-in-Charge may permit cement concrete 1:2:4, in-situ / pre-cast, to act as bond stone, as required. When the work has to be started on the old or the one completed a long while ago or in the previous working seasons, care shall be taken to roughen and clean old surface satisfactorily without disturbing the masonry before

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laying the new. It shall be wetted before laying the bedding mortar.

When practicable, the whole masonry in any structure shall be carried out upto a uniform level throughout. But when breaks are unavoidable in carrying the work continuously in uniform level, sufficiently long steps shall be left. All junction of walls shall be formed at the time when walls are being built. Cross walls should be carefully bonded into the main walls. All masonry built in cement mortar shall be kept continuously wet for 14 days from the date of laying. Should the mortar perish i.e. becomes dry, white or powder through neglect of watering and if the masonry shows hollow joints or non adherence of mortar to the stones or if the work does not conform to drawings and specifications, the work shall be pulled down and rebuilt by the contractor at his own cost and risk. All masonry shall be thoroughly cleaned and washed down on completion and all stains, adhering mortar removed from the surface and raking of joints carried out as the scaffolding is being lowered and removed. Holes left in masonry for supporting scaffolding shall be filled and made good before pointing/ plastering.

7.3 KHANDKI FACING STONE MASONRY :

The specifications for Random rubble masonry as given in item No. 14.2 shall generally apply to these for quality of stones, workmanship etc. except for the following:

The face of the stones shall be square/ rectangular in shape and shall be so dressed alround that those can be set on proper bases and shall render uniform joints. The stones may have bushing on the face but shall not project more than 40 mm. The external faces shall be laid in courses of about 200 mm. height or as specified and the internal face shall be finished with rubble backing.

The other specifications, mode of measurements etc. shall be same as per specifications for R.R. Masonry mentioned above.

7.4 MODE OF MEASUREMENT :

All stone masonry shall be measured in cubic metres as actually done. All openings for windows, doors, lintels etc. shall be deducted to get the net quantity of actual work done. Openings or chases required for P.H. and electrical inserts less than 0.1 sqm. and bearings of precast concrete members shall not be deducted. The rate shall also include cost of corner stones, bond stones, scaffolding ,labour, curing etc.

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8. PRECAST CEMENT CONCRETE SOLID BLOCK MASONRY :

8.1 Scope of Work : The work covered under this specifications pertains to procurement of best quality locally available or locally manufactured precast cement concrete solid block and workmanship in building walls of various thickness in strict compliance with the specifications and applicable drawings.

8.2 Material : Precast cement concrete solid blocks shall be of best quality locally available/ manufactured at site and should be approved by the Engineer-in-Charge before incorporation in the work. The ingredient and the cement concrete used shall confirm to relevant I.S. as stipulated in specification for cement concrete works herein before.

Minimum crushing strength of the solid blocks shall be 40 to 60 Kg/ sqcm. at 28th day after curing. The type of the bond to be adopted will be decided by the Engineer-in-Charge but vertical joints shall be staggered. The size of the blocks shall be 390 x 190 x 140 mm. and 390 x 190 x 100 mm. and the proportion used in making the blocks shall be 1:11 (1 cement : 11 fine and coarse aggregates). The blocks shall be cured well at least for 14 days before incorporation in to the work. The cement mortar for concrete blocks masonry shall be 1:4 and joints shall not be more than 10 mm. thick.

8.3 Workmanship and Mode of Measurement : The workmanship and mode of measurement shall be as stipulated in the specification for brick work as applicable stated earlier and concrete block masonry with 140 mm. thick block shall be measured in sqm. nearest to two places of decimals of a metre. The rate quoted shall include cost of all materials, labour including form work in casting the blocks, curing, transporting, handling, hoisting the blocks to proper level, curing masonry etc. complete.

9. CEMENT PLASTERING FOR WALLS & CEILINGS AND SAND FACE / ROUGH CAST PLASTERS :

9.1 SCOPE OF WORK :

The work covered under these specifications consists of supplying all materials and rendering all types of plaster/pointing finishes strictly in accordance with these specifications, applicable drawings etc. For all finishing works mentioned above, only blended cement shall be a used.

9.2 GENERAL :

Blended cement, sand and water required for the work shall conform to specifications laid down herein before under chapter 4 i.e. Plain and reinforced cement concrete, except that sand for finishing coat shall be fine sand conforming to I.S. 1542. The plastering works shall generally conform to I.S. 1661 (Pt. III) (Code of practice for cement and cement plaster finish on walls and ceilings). All general precautions as specified in I.S. 1661 (Pt. III) clause-8, shall be taken and preparation of the back ground shall be done as laid down in I.S. 1661 clause 5 and I.S. 2402 shall be generally followed for rough cast and sand faced plaster work. Scaffolding required for facility of working shall be provided by the contractor at his own cost. This may be double or single according to the requirement and shall be approved by the Engineer-in-Charge. Stage scaffolding shall be erected when ceiling plastering is done. The contractor shall be responsible for accidents, if any, take place. The contractor shall co- operate with the other agencies also. Whenever electrical contractor/agency has to fix up switch boxes in walls, necessary Thiyyas, Tapanish or Dhadas shall be arranged to be given in advance of actual plastering process at these locations so that the boxes are fixed properly in line with finished plaster surface. All finishing in and around these boxes as also around the conduit boxes in ceiling shall be done by plastering contractor without any extra cost to the Department. The decision of the Engineer-in-Charge in this regard shall be final and binding on the contractor.

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9.3 PREPARATION OF SURFACE :

The surface to be plastered shall first be thoroughly cleaned of all muck and cleaned down. All joints shall be raked out in case of brick work / stone masonry and closely hacked in case of concrete, **under the relevant masonry / concrete items**. The surface to be plastered shall be well wetted for a minimum period of 6 hours before commencing the work. The mortar for all plaster work shall be blended cement mortar of mix as specified in the schedule of quantities.

After erection of scaffolding and before commencement of plastering work, top most junctions/joints/sides with beam/column shall be thoroughly packed with blended cement mortar to prevent cracks.

Before commencement of plastering operation, the contractor shall ensure that all the service pipes, electrical conduits, boxes, switch boxes etc. have been installed in position by other agencies and the plastering surface is duly approved by the Engineer-in-Charge. In order to enable other service contractors to fix the electrical conduits, conduit boxes, EDBs, pipes, outlets etc. in proper level and line with reference to the finished surface of the plaster, Thiyyas and Tapanis i.e. finished plaster patches shall be given by the main civil contractor on walls, ceiling at regular intervals well in advance of his plaster work at no extra cost to the Department. The entire work of preparation of surface before plastering shall thus be co-ordinated by the main civil contractor with all other agencies working at site.

Just before actual plastering work is taken up in hand, all the ceilings and walls etc. shall be marked with Tapanis or Thiyyas indicating the thickness of plaster required and which shall be in true line, level and plumb. The contractor shall get these marks approved by the Engineer-in-Charge before starting the plastering work. The contractor shall also be responsible to render the final surface true to line, level and plumb etc.

All building operations like construction of walls, concreting etc. shall have been completed before plastering is taken up. The plastering operation should be taken up only after the service pipes etc. that are to be embedded in the wall or ceiling are completed and suitably protected against erosion by other agencies and okayed by the Engineer-in-charge. Damage if caused to any of the existing fittings, fixtures, including doors and windows etc. during the plastering operation shall be made good by the contractor at his own cost.

If the surface which is to be plastered either internally or externally is out of plumb and not in line and level and if the plastering to be done is more than specified thickness to bring the plastered surface to perfect line and levels, in such specific cases, chicken wire mesh is to be provided by the contractor at his own cost and the plaster should be done to required line and level with no extra cost whatsoever.

The finished plastered surface shall be free from cracks, fissures, crevices, hair cracks, blisterings, local swellings and flakings. The finished surface shall be true to line, level, plumb & plain and durable. The adhesion of the mortar with the background surface is of prime importance as this affects durability of plaster. Preparation of surface which has to take plastering is of great importance. Before starting the plastering work the surface should be got approved by the Engineer-in-charge.

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In order to avoid the formation of deep and side cracks and for dispersion of cracks at the junctions between concrete surfaces and brick masonry work as also between junction of windows/door frames and brick masonry works, cautionary measures such as fastening and lapping of chicken mesh over the junction areas should be carried out over which the plastering work has to be taken up as required by the Engineer-in-charge.

The minute gap between window/door frames with cills and jambs should be filled up/caulked by plaster of paris/epoxy putty/silicon sealants, Rubber based sealants (brand name TECHMAT/TECHCOAT) by caulking guns or by approved methods as instructed/approved by Engineer-in-Charge.

9.4 GROOVES :

The grooves shall be of required dimensions. The same shall be made to turn wherever necessary. The finish, inside, shall be of the same finish as that of the plaster. The lines of the grooves shall be well defined and rounded. The grooves are to be provided in plastering in internal and external surfaces and shall be paid extra in the rates given in schedule of quantities.

9.5 MIX PROPORTIONS :

The mortar for plastering shall be of proportion as specified in the item schedule. The mixes specified in the schedule are volumetric.

9.6 MIXING :

Cement and fine aggregates shall be mixed dry in the required proportions to obtain a uniform colour. Water shall then be added to get the required consistency for the plaster.

Mixing shall be done mechanically. However, manual mixing will be allowed only in exceptional circumstances at the discretion of the Engineer-in-Charge. Manual mixing, where adopted, shall be carried out on a clean water tight platform. After water is added during mixing, the mix shall be held back and forth for 10 to 15 minutes.

In machine mixing, the mixer shall run atleast five minutes after placing all the ingredients in the drum. Only so much quantity of mortar which can be used within half an hour after the addition of water shall be prepared at a time. Any mortar for plaster which is set or partially set shall be rejected & shall be removed forthwith from the site.

6 / 5 / 15 MM. PLASTER :

The plaster shall be laid with somewhat more than 5 mm. thickness and pressed and levelled with wooden ruler to a finished thickness of 5 mm. Straight edges shall be freely used to ensure a perfectly even surface. All exposed angles and junctions of walls, doors, windows, beams, slabs etc. shall be carefully finished so as to furnish a neat and even surface.

Note: For 6mm plaster, approved bonding agent shall be used as per manufacturer's specifications, wherever specified in the Schedule of Items.

20 MM PLASTER :

The proportions of sand and cement shall be as specified and shall cover all irregularities, undulations, depressions due to chasing etc. in the surface to be plastered. The mortar shall be applied slightly more than 20 mm. thick and pressed and levelled with wooden ruler or straight edge to finished thickness of 20 mm. Straight edges shall be freely used to ensure a perfectly even surface. The finished surface shall be true and even and present uniform texture throughout and all joining marks shall be eliminated. All corners, edges and angles shall be made perfectly to line, plane and plumb. All exposed angles and junctions of walls, doors, windows, beams, slabs etc. shall be carefully finished so as to furnish a neat and even surface.

Plastering items amongst all other things as described in various items also include:

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i) Preparation of surfaces to receive the plaster, providing cement plaster of the specified average thickness and proportions with specified number of coats.

ii) All labour, materials, scaffolding, use of tools and equipment to complete the plastering work as per specifications.

iii) Curing for 10 days.

iv) Cleaning the surface of doors, windows, floors or any other surfaces where plastering might have splashed. v) Finishing the portion of plaster left above the terrazo, plain cement tiles, ironite or any type of skirting work to be finished rounded or as directed by the Engineer-in-Charge, in a separate operation after laying of floor tiles skirting.

9.7 (A) NEERU FINISH :

Wherever specified, the surface rendered shall be finished smooth with good quality lime neeru class 'C' conforming to I.S. 75-1956. The lime shall be tested in an approved testing laboratory for the chemical analysis of the lime and test certificate submitted regarding suitability of lime for plaster work. The cost of testing shall be borne by the contractor. Neeru shall be prepared at site out of best quality pure fat lime slaked at site with fresh water and slaked in accordance with the relevant I.S. code for slaking of lime. The slaked and sifted lime shall be reduced to a fine paste by grinding 150 turns in a mortar mill. Sufficient quantity, which can be used within 10 days only shall be prepared at a time. Chopped hessian or jute fibre in the required quantity may also be added to neeru and properly ground to pure paste as per directions of the Engineer-in-Charge.

An entire unobstructed area shall be plastered in one operation. Neeru shall be applied to the prepared and partially set but somewhat plastic surface with steel trowel to a thickness slightlty exceeding 1.5 mm. (1/16") and rubbed down to 1.5 mm. It shall be polished to perfectly smooth and even finish working from top to bottom for at least 3 days. All corners shall be truly brought to desired lines and levels in the base plaster along and the thickness of neeru shall not exceed 1.5 mm., at these locations. Moistening shall be commenced as soon as the plaster has hardened sufficiently and is not susceptable to injury. The surfaces shall be kept sprinkled with water for 7 days to prevent excessive evaporation. On the sunny or wind-ward side of the building in hot dry weather, matting or gunny bags may be hung over on the outside of the plaster and kept them wet. If blow holes are observed in neeru plaster at any time during the contract period and during the defect liability period, the contractor will have to rectify the defective neeru plaster work including redoing of the white washing/colour washing/distempering work etc. as the case may be, entirely at his own cost.

It shall be the contractors responsibility to ensure that cracks do not develop during the execution or subsequently during the defect liability period and the cracks if any observed shall be rectified including finishing, white washing/painting as specified, without any extra cost to the Department, to the entire satisfaction of the Engineer-in-charge.

9.7 (B) TEROL FINISH OF TERRACO :

Wherever specified, the surface rendered shall be finished smooth with 0.5 to 3 mm. thick coat of TEROL of TERRACO as per manufacturers specification. It shall be ensured that the surface to be covered is free of loose particles, dust, dirt, grease, oil and paint. TERROL shall be applied on top of finished coat of plaster which should be levelled without any scratch/key marks. Adequate care should be taken that the first coat is levelled well to enable the thin layer TEROL plaster to give smooth finish, substrata/sub base should be moistened with water prior to the application of TEROL thin layer plaster.

1 Mixing : Put water into a clean empty drum. Add TEROL start stirring with paddle.

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Gradually add water and TEROL alternatively in the required proportion to get desired creamy consistency, convenient for application and stir continuously and ensure that no lumps remain. TEROL should not be allowed to stand without stirring for longer than 60 minutes. In normal condition let TEROL set for 5 minutes then stir and use. Where rapid drying conditions are prevalent, it is advisable to mix TEROL 20 minutes before using.

2 Application : TEROL is sprayed or hand applied and smoothened with a steel float. Smooth finishing shall be achieved with wooden floating or troweling when TEROL has set. The float should be moistened during the smoothening operation.

Curing the surface shall be carried out after 24 hours of application at least for 4 days using light water spray.

9.7 (C) PLASTER OF PARIS (POP – $CaSO_4$, 1 / $2H_2O$) FINISH :

Wherever specified, the wall / ceiling surfaces shall be finished smooth with approved quality Plaster of Paris (POP). POP shall be mixed in water for dehydration at site. Sufficient quantity, which can be used within half an hour only, shall be prepared at a time.

POP shall be applied immediately after the under coat of cement plaster has set. An entire unobstructed area shall be finished in one operation. POP shall be applied on top of finished coat of plaster which should be levelled without any scratch/key marks to the prepared and partially set. It shall be ensured that the surface to be covered is free of loose particles, dust, dirt, grease, oil and paint.It shall be applied with steel trowel to a thickness slightly exceeding 2 mm and rubbed down to 2 mm. It shall be polished to perfectly silk smooth and even finish working from top to bottom. All corners shall be truly brought to desired lines and levels in the base plaster along and the thickness of POP shall not exceed 2 mm, at these locations.

If blow holes / cracks are observed in POP plaster at any time during the contract period and during the defects liability period, the contractor will have to rectify the same including redoing painting to match with the adjacent surface etc., all at his own cost to the entire satisfaction of the Engineer-in-charge.

SAND FACED CEMENT PLASTER:

9.8.1 GENERAL : Materials and preparation of surfaces and scaffolding etc. for sand faced plaster wherever applicable shall conform to specification laid down here-in-before under section cement plastering and the following specifications are also to be complied with:

9.8.2 PREPARATION OF SURFACE : The surface to be plastered shall first be thoroughly cleaned down. All joints shall be raked out in case of brick work / stone masonry and closely hacked and wire brushed in case of concrete, **under the relevant masonry / concrete items**. The surface to be plastered shall be well wetted for a minimum period of 6 hours before commencing the work. The mortar for all plaster work shall be cement sand mortar of mix as specified in the schedule of quantities.

Double scaffoldings required for facility of construction shall be provided by the contractor at his own expenses wherever directed by the Engineer-in-Charge. Scaffolding shall be erected with pipes or ballies or bamboos of adequate strength so as to be safe for all the dead, live and impact loads likely to sustain by it during construction operations. The contractor shall take all measures to ensure the safety of the work and workmen. Any instruction of the Engineer-in-Charge in this respect shall also be complied with. The contractor shall be entirely responsible for any damage to Government property or injury to persons, resulting from faulty scaffolding, defective ladders and materials or otherwise arising out of his default in this respect. Proper scaffolding shall be provided to allow easy approach for workmen and supervisory staff to every part of the work. Ballies, bamboos etc. for scaffolding shall not be tied to the windows, doors, mulliions,

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ventilators etc. Any damage done to the windows, doors etc. shall be made good by the contractor to the original conditions at his own cost. For better safety, steel pipe scaffolding is preferred.

9.8.3 WORKMANSHIP : The surface to be plastered shall first be dubbed out with cement mortar to cover all irregularities and faces upto proudest part. The dubbing coat which shall be of proportion as specified in schedule and a 5 mm. thick (1/2") layer shall then be applied/scored and keys shall be formed on the surface by thoroughly combing it with heavy horizontal lines about 5 mm. (1/2") apart and about 3 mm. (1/8") deep when mortar has just set.

The cement mortar for sand faced plaster shall have washed and approved sand with slightly larger proportions of coarse materials, but not exceeding 3 mm. The proportion of cement to sand shall be as specified in the schedule. The water is gradually added to make the mixture homogenous. The thickness of finishing coat excluding key shall be 8mm. (about 5/16"). After application the surface should be finished with a wooden float lined with cork closely pricked on with a wet sponge tapped gently to bring sand particles into prominence.

The chajjas and any other horizontal portions shall be cleaned and set mortar that might have been fallen at the time of plastering at higher elevation, before plastering work is taken up. Junction of wall and chajja shall be rounded off simultaneously as directed by the Engineer-in-Charge.

9.9 ROUGH CAST PLASTER :

All materials shall conform to the standards already specified for plaster described above. The preparation of the surface to received the rough cast plaster shall be as described under sand face plaster. Rough cast plaster shall be carried out in two coats. First coat shall consist of 1 part of cement to 3 parts of clean sand or as specified otherwise. The finished thickness of the first coat shall be 5mm. and shall be laid by throwing the mortar (By using strong whipping motion) on the prepared surface with a trowel in a uniform layer but shall not be smooth. The second coat consists of 1 part of cement and 3 part of 6 mm. to 10 mm. down gravel all as approved by the Engineer-in-Charge. The gravel shall thoroughly be got cleaned with water removing all dirt and other organic materials. All these ingredients shall be mixed into a paste which shall be flung upon the first coat with large trowels to form an even protective coat. The second coat must be applied while the first coat is still soft and unset. The thickness of this coat shall be 10 mm. only. Due care shall be taken to avoid concentration of either large size or small size of gravel in one place. A sample of rough cast plaster shall also be got approved by the Engineer-in- Charge as regards the texture etc. before proceeding further with the work. All subsequent work shall generally conform to the approved sample panel. The finished work shall be cured for a minimum period of seven days.

General workmanship, scaffolding, preparation of surface, curing etc. shall conform to the specification already laid down under sand faced plastering.

The contractor shall take special care at the time of plastering or pointing to keep the m.s./aluminium window/wallspan etc. fixed by other agency in correct shape, position and to cover the same with required hessian cloth/gunny bags to keep away from sprinkling of plasters/paint etc. The damage caused to the above if any, shall be made good by the contractor at his own cost.

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9.10 MODE OF MEASUREMENT:

9.10.1: Area of plastering will be measured net and shall be paid for. The measurement of length of wall plastering shall be taken between walls or partitions (dimensions before plastering shall be taken) for the length and from top of the floor or skirting or dado as the case may be to the underside of ceiling for the height. All openings more than 0.1 sqm. shall be deducted and all jambs, soffits, sills of these openings if done, will be measured to arrive to the net area for payment. No opening less than 0.1 sqm. shall be deducted and no jambs etc. for such openings shall be measured for payment. The rate shall include the cost of finishing all the edges, corners, cost of all materials, labours, scaffolding, transport, curing etc.

9.10.2 : The rate shall include the cost of finishing all the edges, corners, cost of all materials, labour, transport, scaffolding, curing etc. and grooves if so specified in the item of schedule of quantities.

The rate for plastering should include the cost of work towards the following items for co-ordination with electrical item:

1. Neatly plastering around DBs, junction boxes, M.S. boxes etc. should be done and made matching with the wall finish after installation of electrical equipments.

2. All DBs, service boxes, covers etc. should be covered by a plastic cloth or other suitable covering materials such that water or materials should not splash the same during brick work and plastering work. This is to be done in such a way that electrical equipments as well as painted surfaces are not spoiled.

3. For fixing M.S. boxes, DBs etc. Thiyya should be given such that the required face of the M.S. box, DB covers etc inline with final finished plastered surface.

4. The rate for the item shall also include rounding up of corner and angles making sharp corners and angles finishing around ceiling rose and electrical fittings etc. fixed by other agencies, finishing of top of dado and skirting (zad finishing), junctions of roof and wall or beam with the finish as specified in the item. Plastering of brick and concrete cornice and copings and plastering in restricted areas if any shall not be measured separately. Architectural bands and narrow widths of plaster over structural as well as non-structural and the line when prepared in the same thickness of plaster shall not be measured separately and shall be covered by respective plaster items.

9.10.3 ROUGH CAST PLASTER : The area of surfaces actually plastered will be measured net and shall be paid for. The measurements of length and height of wall plastered shall be correct to a centimeter taken between walls or projections including the width of corner edge strips including the areas of grooves. All the openings more than 0.1 sqm. shall be deducted and all jambs, soffits and sills of these openings, if plastered will be measured to arrive at the net area for the payment. No opening less than 0.1 sqm. shall be deducted and no jambs etc. for such openings shall be measured for payment. Corner/edges finishing will not be measured separately and the rate shall include the cost of finishing all the edges, corner strips in addition to the cost of all materials, labour, transport, scaffolding, curing etc. and grooves if so specified in the item of schedule of quantities.

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10. ROAD AND PAVEMENTS :

SCOPE OF WORK :

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

Approximate quantities of materials to be used in the work are listed below for reference:

SN	MATERIAL	DESCRIPTION	CONSUMPTION
i)	**Soling stone**	a) for 230 mm. thick consolidated	2.65 cum./10
		b) for 150 mm. thick consolidated	1.725 cum./10
ii)	**Stone aggregate** 50 mm. nominal size	for 75 mm. thick consolidated W.B.M.	0.975 cum./10 sqm.
iii)	**Murrum**	for 75 mm. thick consolidated W.B.M	0.305 cum./10
iv)	**Bituminous macadam**	for premix carpets for 38 mm. consolidated thickness	11 sqm./mt.
v)	**Seal coat** (Bituminous concrete for wearing course)	for 5 mm. consolidated thickness	33 sqm./mt.

10.1 EARTH WORK IN EXCAVATION :

The specifications for “Earth work” under chapter - 1, specified here-in-before shall hold good as far as they are applicable.

10.2 FORMING EMBANKMENT :

The work shall include preliminaries of clearing site, setting out and preparing the ground and there after forming embankment for the roads, paths etc. with approved material available form excavations under this contract (excavation paid separately under respective items) or elsewhere, spreading in layers, watering and compacting to the required density and lines, curves, grades, camber and cross section and dimensions shown in the plan or as directed by the Engineer-in-Charge. When the embankment is to be laid on hill sides or slopes, the existing slopes are to be ploughed deeply. If the cross slopes are steeper than 1 in 3, steps with reverse slope shall be cut into the slopes to give proper hold and seating to the bank as directed by the Engineer-in-Charge. The top 15 cm. of soil shall be scarified and watered if directed and compacted to the same density as specified for the embankment before any material is laid for the embankment work.

Only the approved excavated earth shall be placed in the embankments in successive horizontal layers not exceeding 200 mm. extending to the full width of the embankment including the slopes at the level of the particular layer and 30 cm. more on both sides to allow compaction of the full specified section. The extra loose stuff at the edges shall be trimmed later after completion of the bank work without extra cost leaving the correct section fully compacted.

Keeping the width of the bank initially less and widening it later by dumping loose earth on the slopes shall not be permitted as the additional width and slopes will remain loose and uncompacted. Similar procedure to extend the embankment by dumping the material longitudinally shall also not be allowed. Each layer of the embankment shall be watered, levelled and compacted as specified here-in-after, before the succeeding layers are placed. The surface of the embankment shall at all times during construction, be maintained in such a manner so

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as to prevent ponding. Water to be used shall be free from all harmful elements which may cause efflorescence etc. and approved by the Engineer-in-Charge.

If the material for embankment contains moisture less than the optimum moisture, water shall be added in the 100 mm. layers of the embankment to bring moisture uniformly upto requirement. If the excavated material contain more than required moisture, it shall be allowed to dry until the moisture is reduced to required extent. If due to the wetness, the moisture content of the soil cannot be reduced to the appropriate amount by exposure, embankment work shall be suspended till suitable conditions prevail at no extra claim/compensation.

When loose layer is levelled manually or mechanically and moistened or dried to a uniform moisture content suitable for maximum compaction, it shall be compacted by 8 to 10 tonne power roller or sheep foot rollers or heavy hauling or dozing equipment to give the specified 90% of the proctor density. If on testing, the density is found to be less than 90% of the proctor density, the contractor shall do additional compaction necessary to get the specified density after adding water if required. If the density cannot be improved by such reasonable efforts, the work may be accepted as substandard work by the Engineer-in-Charge, if he thinks it is not harmful for the

purpose and paid for at a reduced rate. Test shall be made to determine the maximum density of the material to be used by the proctor method before starting the work. Density test shall be carried out for the embankment work during the progress of the work. One set of three core samples for every 1000 sqm. (about 1000 sq.yd.) area of each layer of embankment work shall be taken and tested. The average density shall not be less than 90% of the proctor density, obtained in the laboratory.

Arrangement for obtaining the samples and transporting the same to laboratory, shall be made by the contractor at his own cost.

Embankment not accessible to rollers, such as those adjoining bridges, culverts and other works shall be carried out independently of the main embankments and shall have the layers placed in 150 mm. to 200 mm. height and each layer shall be moistened and thoroughly compacted with mechanical or manual tamper. Before placing the next layer, the surface of the under layer shall be moistened and scarified so as to provide a satisfactory bond with the next layer.

The embankment shall be finished and dressed smooth and even, in conformity with the alignment levels and cross sections and dimensions shown on the drawing. On curves, section shall be provided with super elevation and increased width, as shown on the plans as directed by the Engineer-in-Charge.

Joining of old and new embankments shall be done by stepping in an overall slope of about 1 to 5.The contractor shall be responsible for maintaining the embankment work in satisfactory conditions at his own cost till finally accepted including making good any damage.

MEASUREMENT AND RATE :

The contract rate shall be per cubic metre of the finished embankment. Measurements shall normally be taken by taking cross sections at suitable intervals. The measurements of the section shall be limited to the dimensions shown on the drawing or those ordered by the Engineer-in-Charge in writing. The sectional area shall be worked out correct upto two places of decimal of square metre and the quantity worked out to two places of decimal of cubic metre on lines similar to those specified for earth work here-in-before.

60.2A SUB GRADE :

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

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shall be corrected and the sub-grade dressed off parallel to finished profile.

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

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

PERMISSIBLE TOLERANCES OF SURFACE REGULARITY

Longitudinal profile	**Cross profile**
Maximum permissible undulation when measured with a 3 metre straight edge	Maximum permissible variation from specified profile when measured with a
24m	**15m**

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

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

10.3 SUB-BASES :

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

SPECIFICATIONS FOR LAYING :

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

Coarse Aggregate			**Stone Screenings**		**Blindin g materia**
Classification	Size Range	Net Qty.	Grading/Clas sifi cation	Net Qty	
Grading - I	90mm to 45mm	1.2 Cum. to 1.28 Cum	Type A 6.2 mm	0.27 Cum. to 0.30 Cum	0.08 Cum. to 0.10 Cum.

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

Preparation of Foundation : In the case of an existing unsurfaced road, where new materials is to be laid, the surface shall be scarified and reshaped to the required grade, camber and shape as necessary. Weak places shall be strengthened, corrugations removed and depressions and pot holes made good with suitable materials, before spreading the aggregate for W.B.M.

Spreading Aggregate : The coarse aggregate shall be spread uniformly and evenly upon the prepared base in required quantities with a twisting motion to avoid segregation. In no case shall these be dumped in heaps directly on the area where these are to be laid nor shall their

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hauling over a partly completed base be permitted. The aggregates shall be spread uniformly to proper profile by using templates placed across the road six metres apart. Where specified, approved mechanical devices may be used to spread the aggregates uniformly. The levels along the longitudinal direction upon which the metal shall be laid, shall be first obtained at site to the satisfaction of Engineer-in- charge and these shall be adhered to.

The surface of the aggregate spread shall be carefully trued up and all high or low spots remedied by removing or adding aggregate as may be required.

The W.B.M. sub-base shall be normally constructed in layers of 115 mm compacted thickness. No segregation of large or fine particles shall be allowed and the coarse aggregate as spread shall be of uniform gradation with no pockets of fine material.

The coarse aggregate shall normally not be spread in lengths exceeding three days average work ahead of the rolling and blending of the proceeding section.

Rolling : Immediately following the spreading of the coarse aggregate, it shall be compacted to the full width by rolling with either a three-wheel power roller of 8 to 10 tonnes capacity or an equivalent vibratory roller. Initially, light rolling is to be done which shall be discontinued when the aggregate is partially compacted with sufficient void space in them to permit application of screenings.

The rolling shall begin from the edges with the roller running forward and backward and adding the screenings simultaneously until the edges have been firmly compacted. The roller shall then progress gradually from the edges to the centre, parallel to the centre line of the road and overlapping uniformly each preceding rear wheel track by one half width and shall continue until the entire area of the course has been rolled by the rear wheel. Rolling shall continue until the road metal is thoroughly keyed with no creeping of metal ahead of the roller. Only slight sprinkling of water may be done during rolling, if required. On super elevated curves, the rolling shall proceed from the lower edge and progress gradually continuing towards the upper edge of the pavement.

Rolling shall not be done when the sub-grade is soft or yielding or when the rolling causes a wave like motion in the sub-base or sub-grade. When rolling develops irregularities that exceed 5 mm when tested with a three metre straight edge, the irregular surface shall be loosened and then aggregate added to or removed from it as required and the area rolled until it gives a uniform surface conforming to the desired cross-section and grade. The surface shall also be checked transversely by template for camber and any irregularities corrected in the manner described above. In no case shall the use of screenings to make up depressions be permitted.

Application of Screenings : After the coarse aggregate has been lightly rolled to the required true surface, screenings shall be applied gradually over the surface to completely fill the interstices. Dry rolling shall be continued while the screenings are being spread so that the jarring effect of the roller causes them to settle into the voids of the coarse aggregates. The screenings shall not be dumped in piles on the coarse aggregate but shall be spread uniformly in successive thin layers either by the spreading motion of the hand, shovels or a mechanical spreader.

The screenings shall be applied at a slow rate (in three or more applications) so as to ensure filling of all voids. Rolling and brooming shall continue with the spreading of the screenings. Either mechanical brooms or hand brooms or both may be used. In no case shall the screenings be applied, so fast and thick as to form cakes, ridges on the surface making the filling of voids difficult, or to prevent the direct bearing of the roller on the coarse aggregates. The spreading, rolling and brooming of screenings shall be performed on sections which can be completed within one day's operation and shall continue until no more screenings can be forced into the voids of the coarse aggregate. Damp and wet screenings shall not be used under any circumstances.

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Sprinkling and Grouting : After spreading the screening and rolling, the surface shall be copiously sprinkled with water, swept and rolled. Hand brooms shall be used to sweep the wet screening into the voids and to distribute them evenly. The sprinkling, sweeping and rolling operations shall be continued and additional screenings applied where necessary until the coarse aggregates are well bonded and firmly set for the entire depth and until a grout has been formed of screenings and water that will fill all voids and form a wave of grout ahead of the wheels of the roller. The quantity of water to be used during the construction shall not be excessive so as to cause damage to the sub- base or sub-grade.

Application of Blinding Material : After the application of screenings and rolling, a suitable blinding material shall be applied at a uniform and slow rate in two or more successive thin layers. After each application of blinding material, the surface shall be copiously sprinkled with water and the resulting slurry swept-in with hand brooms or mechanical brooms or both so as to fill the voids properly. The surface shall then be rolled by a 8-10 tonne roller, water being applied to the wheels in order to wash down the blinding material that may get stuck to the wheels. The spreading of blinding material, sprinkling of water, sweeping with brooms and rolling shall continue until the slurry that is formed well, after filling the voids form a wave ahead of wheels of the moving roller.

Setting and Drying : After final compaction of the course, the road shall be allowed to cure overnight. Next morning defective spots shall be filled with screenings or blinding material, lightly sprinkled with water, if necessary and rolled. No traffic shall be allowed till the macadam sets.

Surface Evenness : The surface evenness of completed W.B.M. sub-base in the longitudinal and transverse directions shall be as specified in the table given below:

Size of coarse	Longitudinal profile	Cross profile
	Max. permissible undulation when measured with a 3 M	Max. permissible undulation when measured with a
45-90 mm	15 mm	5 mm

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

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

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

10.3.2 RUBBLE SOLING :

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

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with the following additions:

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

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

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

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

10.4 WATER BOUND MACADAM :

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

b) Collection of metal : Metal shall be of first sort black trap stone and shall be collected in stacks on level ground and stacked on the sides of the road as directed. The metal shall be free from all earth, rubbish and vegetable matter and graded before stacking and closely packed in stacks. The metal supplied by the contractor shall be arranged in stacks for measurement. No deductions will be made for voids. The size of stack shall be 1 m. wide at top, 2.2 m. wide at bottom and 60 cm. high. The length shall be as directed by the Engineer-in-Charge. The contractor shall provide the templates required to ensure, compliance with size of stack stipulated.

c) Supply of Murrum : The contractor shall be permitted to excavate in the selected areas in the township/site of work, as approved by the Engineer-in-Charge, for collection of murrum. The excavation shall be done by the contractor to correct line and level, transport and stack the same at site of work as directed by the Engineer-in- Charge. Alternately, the contractor will be permitted to bring from outside, approved graded hard murrum 10 mm. down to dust (but not silt) as directed by the Engineer-in-Charge and shall also be collected in stacks on level ground along side of the road.

The stacks shall be measured in cubic metre for payment before using it for blinding. No deduction shall be made for voids.

d) Laying and preparation of water bound macadam surface :

i) After preparation of the existing surface as specified above, 50 mm size metal collected in stacks shall be spread to uniform thickness over the prepared surface and consolidated to 75 mm thickness as specified here-in-after.

ii) Templates properly made of full width and gauge or templates fitted with central plumb to each edge fixed with it must be used. The depth of the plank forming the gauge shall be

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the thickness of the metal layer in loose state so that when the metal has been properly spread, the gauges are buried just flush with the surface. The intermediate work shall be tested with cord stretched between the gauge. Three templates shall be provided and used with a distance of about 7.5 Metres between each but not exceeding 15 Metres. A spirit level shall invariably be used with the templates to ensure that the edges of metalling are truly levelled. The metal shall be spread and rolled with 8 to 10 tonne power roller until well compacted and there is no appreciable movement (in the metal) when walked upon, or no appreciable wave in front of the advancing roller. Rolling shall be done by roller perfectly, by a 8 to 10 tonne power roller, till proper internal packing of adjacent pieces of stones has been achieved. Excessive dry rolling shall be avoided.

iii) Rolling shall commence from the edge to the centre of the road. In case of super elevated curve, rolling shall commence from the inside edge of the centre and progress towards the outside edge. Where the gradient is steeper than 1 in 60, the roller shall run up grade, i.e. rolling shall be started from lower level to upward direction for the 1St. rolling.

iv) While rolling the surface in two or more parts, a strip of about 230 mm. to 300 mm. along the predetermined cross section shall be left unrolled while consolidating the first half. This shall be properly jointed when the metal is being spread on the second half and consolidated with it. Care must be taken to avoid the occurrence of a continuous longitudinal furrow along cross section of the road. Full width of road will be rolled at a time.

v) The metalling shall be moderately kept saturated and rolling continued until consolidation is completed. Just enough watering shall be done so as to flush the metal slurry into the interstices. Care shall be taken to avoid excess water softening the subsoil. The full consolidation stage shall be tested by (a) putting a piece of metal about the size of wal-nut on the surface and roller passed over it. If it is crushed the surface shall be deemed as well consolidated (b) there shall be no creeping of stone ahead of the roller.

vi) Until the above conditions are satisfied, no blinding or surfacing materials shall be put on the surface. No rolling shall be done where signs of metal crushing are noticed or rolling causes wave like motions in the base course of sub-grade. Over rolling shall not be done. About 20 to 30 trips of the roller shall normally suffice to make the surface well compacted. Before starting rolling, the metal shall be dressed accurately to camber. No fresh metal shall be added once dry consolidation has commenced. The part of the road must be fully raked up so that the metal is thoroughly incorporated into the body of road.

e) Blinding Course : When the required consolidation has been completed, the blinding material of approved graded murrum/stone grit and dust (unscreened) as specified shall be spread over the surface and brushed backwards and forwards to fill in the surface voids and rolling and watering continued to such an extent that the blinding materials are formed into a slurry and is grouted into the interstices. After the road has been fully consolidated, the surface shall be covered with 5 mm layer of murrum/stone grit and dust (unscreened) and road opened to traffic after 4 days. The road shall be kept watered for 14 days or such other period as specified by the Engineer-in-charge. Where tracks are likely to be formed by the traffic on the road, barriers such as tree branches etc. shall be put to divert the traffic. After 15 days, light watering and rolling shall be done. For joints across the road, the end of each layer shall be given a flat slope and well consolidated together and hump formation must be avoided.

f) Damages to the Department's Property : Any damage to the Deptt's property due to negligence of the contractor while executing the work shall be made good to the original condition at his own cost.

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g) MODE OF MEASUREMENT :

The areas of water bound macadam road surfaces of required thickness actually completed as per above specifications limiting to the areas as per drawing shall be measured in square metre upto two places of decimal,for payment.

The item includes laying, spreading, watering, consolidation, blinding etc. but excluding the cost of 50 mm size I.R.C. metal and graded murrum which will be paid under relevant item. However Murrum obtained from excavation work under this contract and used as blinding material as above on instructions/approval of the Engineer-in-charge shall not be paid.

10.5 BITUMINOUS MACADAM & BITUMINOUS CONCRETE SURFACING FOR ROAD (GENERAL) : SCOPE OF WORK :

The work covered under these specifications provides for bituminous treatment for roads consisting of providing 38 mm thick bituminous macadam and 5 mm thick seal coat or bituminous concrete of thickness as specified in item in the schedule of quantities.

The contractor shall make at his own cost, all the arrangements for controlling the traffic during the execution of the work. All arrangements such as proper barricading of road, diversion of road if necessary, red and green flags during the day, red lights at nights shall be made by the contractor at his own cost to control and safeguard the traffic.

10.5.0 BITUMINOUS MACADAM OVER WATER BOUND MACADAM :

10.5.1 Preparation of Existing Water Bound Macadam Surface : The existing water bound macadam surface shall be brushed, cleaned properly with wire brushes and coir brooms, so as to free from all loose materials, murrum, earth, silt and caked mud etc. The surface shall then be dusted clean with gunny bags etc. If during the process of cleaning the sub grade (water abound macadam), soft spots and pockets, hollows etc. are found, such spots/pockets will be filled with approved precoated bituminous chips, consolidated and finished to proper level, rolled with power roller if necessary. The pot holes shall be excavated properly in a rectangular or rhomboidal shape with vertical edges. The bottom and sides shall be cleaned as stated above. The sides and bottom shall then be thoroughly painted with heated 60/70 penetration bitumen. The pot holes shall thereafter be filled with premixed bituminous chips so that after thorough tamping and rolling, the surface is flush with surrounding road surface all as directed by the Engineer-in- Charge. It shall be the responsibility of the contractor to ensure that the subgrade is even and is finished to camber and slope as shown on the drawings or as directed by the Engineer-in-Charge.

The surface of the subgrade shall be checked for its trueness by means of the scratch template resting on side forms having scratch points placed at not less than 200 mm. apart and set to the exact profile of the base course. The template shall be drawn along the forms at right angles to the road.

Unevenness of the surfaces as indicated by the scratch points shall not exceed 10 mm. in 30 m. The area of depression shall then be painted or sprayed with 60/70 penetration bitumen at the rate of 0.75 kg. per sqm. and the leveling course applied by hand or machine to grade and camber and rolled. If the depressions are deeper than 50 mm., the levelling course shall be applied in two or more layers and rolled as directed by the Engineer-in-Charge.

The prepared surface shall be closed to traffic and maintained fully clean and no asphalting work shall be started unless this prepared surface is approved by the Engineer-in-Charge.

10.5.2 MATERIALS :

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Representative samples of materials proposed to be used shall be submitted to the Engineer-in-Charge and got approved. No material shall be used unless it is approved by the Engineer-in-Charge.

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10.5.3 HOT MIXED HOT LAID BITUMINOUS MACADAM :

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

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

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

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

B.S. Sieve Designation	Equivalent I.S. Sieves	Passing percentage
32 mm. (about 1.25")	40 mm. (1.5")	100
20 mm. (about 3/4")	20 mm.	50 - 100
5 mm. (about 1/2")	5.5 mm.	30 - 60
6 mm. (about 1/4")	6.3 mm.	18 - 30
No. 10	1.7 mm.	10 - 20
No. 200	75 micron	0 - 5

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

2 Bitumen : Bitumen to be used shall conform to I.S. 73-1992 for paving bitumen, with 60/70 penetration and shall be from approved manufacturers.

The contractor on demand by the Engineer, obtain and furnish a laboratory test certificate to the effect that the material conforming to the requirement of the specified grade, to the satisfaction of the Engineer-in-Charge. Bitumen (60/70 penetration) content 3.7% to 4.7% by weight of the total mix, shall be used in the mixture.

3 Tack Coat : Bitumen of the same grade as that used for premix shall be heated to a temperature of 163^0C to 177^0C (325^0F to 350^0F) in a bitumen boiler and the hot bitumen shall be applied evenly to the thoroughly cleaned and prepared road surface (as specified here-in-before) @ 7.5 kg. per 10 sqm. leaving no part of the surface unpainted. Application shall be done by a mechanical pressure sprayer or if permitted, by perforated pouring cans. The tack coat shall be applied just before the macadam is laid. Application of tack coat shall be only slightly in advance of laying premixed chips.

In case of surface already asphalted, application of tack coat is not necessary.

4 Premixing Chips : The bitumen shall be heated to 163^0 C to 177^0 C (325^0 F to 350^0 F) in boiler. The aggregate of the approved grading or as decided by the preliminary tests shall be dried and heated in an aggregate drier to a temperature of 149^0 C to 177^0 C (300^0 F to 350^0 F) and fed into a twin shaft peddle type mixer at a temperature not less than 149^0C (about 300^0F). The bitumen, the approved aggregate and the filler shall be measured separately and accurately to the proportions in which they are to be mixed and mixed intimately till all the particles are completely coated with bitumen. Asphalt/bituminous

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mixing plant proposed to be used by the contractor for the preparation of Asphalt/bituminous mixing shall conform to all of the requirements of the job, which shall produce uniform mixtures of the required quality, and got approved by the Department before mixing. The temperature of the premix bituminous macadam when leaving the mixer shall not be less than 60 ^{0} C (about 280^0 F) and it shall not be less than 51^0 C (about 250^0 F) at the time of laying.

Bituminous macadam shall be transported to site of work in suitable tipping vehicle properly insulated and covered with canvas or other suitable materials to protect the mixture from weather conditions and to retain the heat. The road surface shall be suitably marked to ensure correct and uniform application. Width of macadam to be laid shall be slightly more (not exceeding 50 mm. on each side) than the required carriage way as per drawing. Excess on either side shall be neatly cut after full compaction to get final width of carriage way as per drawing. The premixed bituminous macadam shall be laid by a mechanical self powered spreader and compactor and finished to correct line, level, & final consolidation done by means of power roller not less than 10 tonne. Any irregularities shall be corrected during rolling.

5 Compaction : The base bituminous macadam course shall be compacted thoroughly and evenly with 10 to5 tonne power roller immediately after it is laid. Compacted thickness shall be as specified in schedule of quantity.

The surface shall be checked for correct grade during and after rolling. Any irregularities shall be corrected by adding precoated chips or removing the surplus. The disturbed surface shall be well compacted again. If necessary, the roller wheel shall be coated with oil to prevent the coated chip from sticking to the wheels. Rolling shall be continued till no wheel marks are left on the surface. The speed of the roller shall be sufficiently slow to prevent any pushing under the wheels.

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

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

2 Coarse Aggregate : The coarse aggregate brought by contractor shall be I.R.C. hard black trap, crushed in mechanical crushers and shall be clean, strong, tough, dense, close grained, angular but not flaky, and free from soft, decayed, weathered portion, coating of dust, dirt or other objectionable matter. Maximum size of the aggregate shall be suitable for the thickness of the seal coat (5mm./15mm. or as specified).

The aggregate grading composition and characteristics of surface (wearing course mix) shall conform to standard code of practice. The mix shall satisfy the following requirements:

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

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

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

4 Bitumen : Bitumen shall be of 60/70 penetration or such other grade specified by the Engineer-in-Charge and shall conform to I.S. 73-1961.

The tenderers shall indicate the exact grading, bitumen content, voids, specific gravity etc. which they propose to adopt for type to treatment offered by them.

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

6 Mixing and Laying Wearing Course : Grade 60/70 bitumen shall be heated to a temperature of 163^0 C to 177^0 C (325^0 F to 350^0 F) in a boiler. The aggregate of the suitable approved grading or as decided by preliminary tests, shall be dried and heated in an aggregate drier to a temperature of 149^0 C to 177^0 C (300^0 F to 350^0 F) and fed into a twin shaft peddle type mixer at a temperature not less than 149^0 C (300^0 F). The bitumen, the aggregate and the filler shall be measured separately and accurately to the proportions in which they are to be mixed and mixed intimately till all the particles are completely coated with bitumen. The quantities of aggregate, bitumen and the filler shall be such as to obtain the percentage of each as specified above or decided after tests. Continues batching and mixing plant shall be used. Asphalt/bituminous mixing plant proposed to be used by the contractor for the preparation of asphalt/bituminous mixes shall conform to all of the requirements of the job, which shall produce uniform mixtures of the required quality.

The temperature of bituminous concrete when leaving the mixer shall not be less than 68^0 C (280^0 F) and it shall not be less than 51^0 C (250^0 F) at the time of laying.

The bituminous concrete shall be transported to the site of work in suitable tipping vehicles properly insulated and covered with canvas or other suitable materials to protect the mixture from weather conditions and to retain the heat.

The mixture shall be spread with mechanical self powered spreader. The bituminous concrete shall be laid to the specified line, curve, grade and camber. Any irregularities shall be corrected immediately before rolling is started. Before laying the mixture, the faces of the joints shall be painted with a uniform coating of hot bitumen. The bituminous concrete shall be laid to such loose depth as to give a compacted layer of specified thickness as per item in the schedule of quantities.

7 Compaction : The bituminous concrete layers shall then be allowed to cool sufficiently such that it does not spread under wheel load of 10/5 tonne power roller. The compaction shall be done by the roller till no wheel mark are left on the surface and no further compaction is possible. The road shall be opened to traffic on cooling of the concrete to the atmospheric temperature or after a lapse of 24 to 40 hr. after laying.

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GENERAL REQUIREMENTS FOR BITUMEN MACADAM & SEAL COAT:

1 Testing : The contractor shall have a well equipped testing laboratory with a competent laboratory staff. Daily tests (not less than two specimen per day) shall be made by them on the bituminous mixture produced to ensure compliance with these specification and copy of the test results duly signed by the competent authority shall be submitted to Engineer-in-Charge for record. Tests shall include water absorption, stability, filler content etc.

The contractor shall give all facilities at all times to the Engineer-in-Charge or his representative to inspect the work or testing done by him.

2 Weighing : Each lorry leaving the plant must be weighed on a weigh bridge in the presence of the representative of the Department and a challan must be issued along with the lorry in duplicate showing the weight of the material loaded in the lorry. As and when required, the said lorries shall also be weighed at the Departments weigh bridge or any other weigh bridge approved by the Engineer-in-Charge to check the tonnage of the material stated on the challans. In case of short fall, the same shall be made good by the contractor without extra cost.

3 Testing Surface : The completed surface when ready for acceptance shall be thoroughly compacted, smooth, true to line, grade, camber and free from irregularities when tested by means of a straight edge of 3 m. long, laid on the finished surface parallel with the centre line of the road, the surface shall in no place vary more than 6mm. from the working edge.

4 MODE OF MEASUREMENT :

i) Measurement for bituminous macadam including filling in pot holes and depressions shall be paid by weight measured in metric tonne used on the job, completed satisfactorily, measured upto second place of decimal including preparing surface, applying tack coat and compacting by roller etc. complete as specified.

ii) Measurement for bituminous concrete (seal coat) shall also be paid by weight as measured at site of work, irrespective of the thickness laid, in Metric tonne used on the job, compacted satisfactorily, measured upto second place of decimal including all the relevant items of work specified.

11. FENCING WORK WITH BARBED WIRE, CHAIN LINK ETC. :

The work shall generally be carried out as per these specifications, relevant drawings and as directed by the Engineer-in-Charge.

11.1 M.S. POSTS AND STRUTS :

All the M.S. posts/struts shall be free from rust, scale, cracks, twists and other defects and shall be fabricated to the required shape and size out of the specified sections. The posts and struts shall be conforming to relevant specifications stipulated here-in-before under relevant sections. All the posts and struts shall be of sizes and lengths as specified in the tender schedule and drawing. The posts and struts shall have split ends for proper fixing and shall be embedded in the cement concrete of mix. 1:3:6 or as specified in the schedule. The exposed surfaces of the posts and struts shall be painted with two coats of synthetic enamel paint of approved make and shade over a coat of approved primer.

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11.2 R.C.C. POSTS AND STRUTS :

All the posts and struts shall be of standard size as specified in schedule. These shall be casted on suitable places/platforms in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 5.5 mm. nominal size) as per relevant specifications stipulated here-in-before. The reinforcement shall be provided as shown in the drawings, as directed by Engineer-in-Charge and specified here-in-before under relevant sections. The posts and struts shall be free from honeycombing, cracks and other defects.

After casting, the posts/struts shall be left at the same place and cured for a minimum period of 7 days. After 7 days curing the same shall be shifted to a levelled ground and stacked for further curing for 14 days. After 21 days of curing only, the posts/struts shall be transported to work site without any damage, for fixing in position.

11.3 SPACING OF THE POSTS AND STRUTS :

The spacing of posts shall be 3 m. centre to centre unless otherwise specified or as directed by the Engineer- in Charge, to suit the dimensions of the area to be fenced. Every 10th posts, last but one end posts, corner posts, and posts where the level of fencing changes in steps and end post when the fencing changes its direction shall be strutted on both sides, or as directed by the Engineer-in-Charge. End posts where barbed wire fencing is discontinued shall be strutted on one side only.

11.4 FIXING OF M.S./R.C.C. POSTS AND STRUTS :

Pits of size 45 x 45 x 45 cm. deep or of sizes mentioned in the drawings, shall first be excavated centrally in the direction of proposed fencing work, true to line and level to receive the posts. In case of struts, the pits shall be so excavated, as to receive minimum 15 cm. concrete cover at any point of the struts to suit its inclination or as shown in the drawing.

The pits shall be filled with a layer of 15 cm. thick cement concrete of specified mix. The posts and struts shall then be placed in the pits, the posts projecting to the specified height above ground level, true to line, plumb and position, by providing adequate supports temporarily, and cement concrete of specified mix. shall then be filled-in so that the posts are embedded in cement concrete blocks of specified sizes. The concrete in foundation shall be watered for atleast 7 days to ensure proper curing.

11.5 BARBED WIRE :

The barbed wire shall be of M.S. or G.I. as specified and it shall generally conform to I.S. 278-1978.

The base metal of the line and point wire shall be of good commercial quality mild steel. The line and point wire shall be circular in section, free from scales and other defects and shall be uniformly galvanised if specified.

The line wire shall be in continuous lengths and shall generally be free from signs of welds. It shall be able to withstand Wrapping and unwrapping 8 turns round its diameter.

The barbed wire shall consist of two splices per reel. The barbed wire shall be formed by twisting two lines wires one containing the barbs.

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The barbed wire and its weight shall be as given in the table below:

Type	Nominal diameter of wire		Nominal distance between two barbs in mm	Mass of complete barbed wire (in
	line wire (in mm.)	point wire (in mm.)		
1.	2.50 (5G)	2.50 (5G)	75	146 (66-155)
2.	2.50	2.50	150	114 (108-50)
3.	2.50	2.00 (14G)	75	117 (108-55)
4.	2.50	2.00	150	96 (89-103)
5.	2.24 (6G)	2.00	75	102 (97-106)
6.	2.24	2.00	150	82 (78- 85)

The barbs shall carry four points and shall be formed by twisting two point wires, each two turns, tightly round one line wire, making altogether 4 (four) complete turns. The barbs shall be so finished that the four points are set and locked at right angles to each other.

The barbs shall have a length of not less than 6 mm. and not more than 18 mm. The points shall be sharp and well pointed. Barbed spacings shall be as given in the above table. Wherever required for every 50 reels or part thereof, samples of the barbed wire and the individual line wires shall be put to tensile test and in case of failure to conform to tensile properties given below, two additional tests of each kind shall be made on the samples cut from other reels.

TENSILE PROPERTIES :

Size of line wire Nominal dia (in mm)	Breaking load of line wire		Min. breaking load of complete barbed wire (in
	Min. (in Kg.)	Max. (in Kg.)	
2.50 (5G)	216	302	444
2.24 (6G)	58	179	263

On the results of these additional tests, the whole or portion of the barbed wire shall be accepted or discarded as the case may be.

11.5.1 Fixing of Barbed Wire : The barbed wire shall be stretched and fixed in number of rows and two diagonals as specified. The bottom row shall be 140 mm. above ground and the rest at 55 mm or at given spacing as per drawing. The diagonals shall be stretched between adjacent posts from top wire of one post to the bottom wire of the 2nd post. The diagonal wires will be interwoven with horizontal wires by fixing the odd rows of wires, then the diagonal cross wires and lastly the even rows of wires. The jointing of the barbed wire in between the posts shall not be permitted.

Necessary holes should be tapped in the post and the barbed wire shall be fixed in position by means of 'U' clamps or bolts and nuts as specified in drawings. In case of fixing with 'U' clamps, the legs of the 'U' clamps passing through the 10 mm. dia. hole in the R.C.C. post to hold barbed wire shall be turned up and down to get an over-lap of 25 mm. on the face of RCC post. Turn buckles and straining bolts shall be used at the end posts if specified.

11.5.2 MODE OF MEASUREMENT :

The work shall be measured in running metre length of fencing correct to a centimetre for the finished work, from centre to centre of the posts. The rate shall include the cost of labour and materials involved in all the operations described above including the cost of barbed wire, turn buckle, straining bolts, bolts and the nuts/U clamps including excavation and foundation concrete or as specified in item description for the work.

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11.6 CHAIN LINK :

The chain link shall be of approved manufacture and of correct size, gauge etc. It shall be of M.S. or G.I. as specified of approved manufacture and of required size, gauge etc. The base materials of the wire shall be of good commercial quality mild steel. The wire shall be circular in section, free from rust, scale, cuts, welds and other defects and shall be uniformly galvanised if specified.

11.6.1 FIXING OF THE CHAIN LINK FENCING TO M.S. OR R.C.C. POST :

The chain link of specified height of fencing shall be fixed first to the end post with necessary G.I. approved type U clamps threaded at both the ends and G.I. nut, bolts, washers etc. and with 6 mm. dia. full height M.S./G.I. anchor bar. After fixing the chain link at the end post, it shall be stretched tightly and fixed to next post one after the other by the above mentioned clamps and bars etc. leaving 50 mm. clearance from the ground and 20 mm. clearance in the case of concrete coping at bottom to avoid rusting. The point at the change in level of the fencing top/bottom, necessary links shall be adjusted suitably as per the manufacturers specification or as directed by the Engineer-in-Charge. The entire chain link fence shall be painted with two coats of synthetic enamel paint of approved make and shade over a coat of approved primer or as specified in the item/drawing.

11.6.2 MEASUREMENT :

The work shall be measured in running metre length of fencing correct to a centimetre for the finished work from centre to centre of the posts.

The rate shall include the cost of labour and material involved in all the operation described above including the cost of barbed wire, turn buckle, straining bolts and bolts and the nuts/U clamps, 6 mm. dia. M.S./G.I. anchor bar etc. including excavation and foundation concrete or as specified in item description for the work.

12. M. S. CRIMPNET GATE :

12.1 MATERIALS :

All steel work, pipe frame work and crimpnet shall be of sizes and sections as per drawings. They shall generally conform to relevant I.S. specifications. The G.I. crimpnet shall be unless otherwise stated, 25 x 25 mm. x 8 g. and of approved manufacture.

12.2 INSTALLATION :

For each leaf of the gate, the crimpnet shall be fixed tightly to internal angle iron frame of required size by means of suitable welding. This internal angle iron frame is then fixed to outer frame of 50 mm. dia. seamless pipes by means of 65 mm. long angle iron lugs welded together. Suitable cleats for the locking arrangement are welded at the height as shown in drawing. Both the leaves of the gates thus be fixed over suitable hinges provided on the side M.S. channel posts of specified sizes. The side post which shall be erected prior to fixing the gates shall be welded with m.s. plates 250 x 150 x 5 mm. at bottom. These posts shall be properly embedded in cement concrete foundations of specified sizes and allowed to set properly.

All the assembly mentioned above shall be properly erected correct to line, level, plumb and render easy and proper movement of shutters.

12.3 The shutters, channel posts and all other steel parts shall be thoroughly cleaned and painted with red oxide primer of approved make and shade. Final painting with two coats of flat oil/synthetic enamel paints of approved shade and make shall be done as directed by the Engineer-in-Charge and as per specifications.

12.4 MODE OF MEASUREMENT :

The length of the gate shall be measured clear in between the side m.s. channel posts and height between the extreme ends of pipes, correct to half centimeter and area worked out in sqm. correct to two places of decimals.

The rate shall include the cost of all materials mentioned above viz. crimpnets, m.s. angles, G.I.pipes, guide plates, channels, base plates, hinges, locking arrangement and other accessories as also necessary excavation in pits, embedding cement concrete, painting etc. all complete. The rates shall be valid for areas in variance by about (+/-) 10% in the overall size of the gate.

13. DRAINAGE WORK WITH NP2 CLASS RCC HUME PIPES :

13.1 R.C.C. SPUN PIPES :

The pipes shall be R.C.C. spun pipes NP2 class, conforming to I.S. 458-1971 and shall be approved by the
Engineer-in-Charge for soundness before incorporation in the work.

13.2 LAYING R.C.C. SPUN PIPES :

The work consist of providing, laying, jointing and testing R.C.C. spun pipe storm water drain of required diameter as mentioned in the schedule to discharge storm water to the main nallah as shown in the drawing.

After the cement concrete cradle has been laid properly, if specified or as directed by the Engineer-in-Charge, the pipes shall be lowered gradually into the trenches over the concrete cradle or bed. Necessary working space/gap for collars shall be made at every joint. Laying of pipe shall proceed upgrade of a slope. The collars shall be slipped-on before the next pipe is laid.

The pipe drain shall rest on the bed at every point through its length. To ensure this the space between the underside of the pipe on the invert of the cradle shall be carefully grouted solid with cement slurry consisting of one part of cement to one part of clean washed sand in such a manner that no void is left. It shall be ensured that the load of the pipes and the super imposed load of the earth filling is evenly distributed on the cradle or bed.

The contractor shall take precautions to see that no dirt, earth or other foreign matter is allowed on the surface of the cradle or bed of the pipe resting there-on, all to the full satisfaction of the Engineer-in-Charge. After the alignment and grading of the pipes is checked by the authorised representative of the Department, the grouting shall be done with specified stiff mix of cement mortar.

The cradle of concrete shall be allowed to set at least for three days before any pipe is placed on it and the contractor shall take due care in setting the pipe in the cradle so that no damage is occur to the cradle. If any damage to the cradle occurs, it shall be rectified to the satisfaction of Engineer-in-Charge and in any particular case where damage to the cradle is beyond repair in the opinion of the Engineer-in-Charge, the contractor shall cut out the damaged section of the cradle and re do the same at his own expenses to the complete satisfaction of the Engineer-in-Charge.

No pipe shall be laid or placed till the alignment of the pipe drain and its levels and gradient have been carefully checked and found correct/approved by the Engineer-in-Charge.

13.3 JOINTS :

The joints for the pipes shall be made by loose collars and the connecting space shall be as minimum as possible. The collars shall be specifically roughened inside to provide a better grip.The two adjacent pipes will be so designed and manufactured that when butted together concentrically, a dowel is left between the two ends. In this dowel, cement mortar of (1:1) proportion or mix. as specified in the schedule be filled and then between the ends a

paste of cement mortar of the same proportions will be placed. The space remaining between the pipe ends and the collar being then caulked with cement mortar of (1:1) or other specified proportion so that an even space appears all round the external diameter of the pipes. All the joints shall be finished off smooth at an angle of 45° with the longitudinal axis of the pipe on either side of the collars.The interior of the pipe drains shall be cleaned off all dirt, cement mortar and superfluous materials and joints shall be cured for atleast 7 days.

13.4 TESTING OF R.C.C. SPUN PIPES :

After sufficient interval has been allowed for the joints to set, the pipe drains will be tested under a water head of at least 1.2 m. and in no case under a head greater than 1.8 m. of water above the top of the pipes. In addition, the pipe drains shall be examined for leaks of land/sub-soil water making its way through the joints. The contractor shall make the pipe drains water tight against the entrance of land/sub-soil water from outside and also against the leakages of water from the inside of the pipe drains at the test heads specified above to the full satisfaction of the Engineer-in-Charge.

All defective or leaking pipes or joints shall be cut out and replaced and made good by the contractor at his own cost. In case of the joints that may be defective and cannot be made good, shall be entirely embedded/surrounded externally with cement concrete of 1:2:4 proportion to render the joint (s) water tight and this shall be allowed to set before encasing or back filling is done. A strong colour shall be added to the water used for testing of the pipes, in order to detect any leakage easily. The cost of testing of the pipe drain shall be borne by the contractor and is deemed to be included in the rates quoted by the contractor.

13.5 ENGINEER-IN-CHARGE MAY ORDER CONCRETE TO BE INCREASED OR DIMINISHED :

The Engineer-in-Charge may increase or decrease the concrete on the pipe drains as to the quantity and quality or to omit the same entirely according to the nature of the ground that may be revealed when the storm water drain trenches are excavated.

13.6 Back filling/filling Trenches :

Filling in trenches for pipes and drains shall be commenced as soon as the joints of pipes and drains have been tested and passed. Where the trenches are excavated in soil, the filling shall be done with earth on the sides and top of pipes in layers not exceeding 20 cm. watered, rammed and consolidated, taking care that no damage is caused to the pipe below. In case of excavation of trenches in rock, the filling upto a depth of 30 cm. above the crown of pipe or barrel shall be done with fine material such as earth, murrum or pulverised decomposed rock according to the availability at site. The remaining filling shall be done with rock filling or boulders of size not exceeding 15 cm. mixed with fine material as available to fill up the voids, watered, rammed and consolidated in layers not exceeding 30 cm.

13.7 MODE OF MEASUREMENT :

The length of pipes shall be measured in running metre nearest to a centimetre along the centre line of the pipes over all fittings such as collars, bends, junctions etc. Fittings/specials shall not be measured separately.

The rate shall include the cost of materials and labour including jointing, grouting, cutting of pipes to the required lengths, wastages etc. involved in all the operations described above.Excavation, back filling, shoring and timbering in trenches and cement concreting wherever required shall be measured separately under relevant items of work.