



TENDER DOCUMENT

FOR

CONSTRUCTION OF VERTICAL EXPANSION
(UPPER FLOORS FROM 2nd TO 6th)
AT IWAI OFFICE CUM R & D COMPLEX AT
A-13, SECTOR-1, NOIDA

(SH:CIVIL, WATER SUPPLY & SANITARY INSTALLATION,
INTERNAL ELECTRICAL AND FIRE-FIGHTING WORKS, ETC.)

TENDER NO. : IWAI/PR/Bldg/42/2011

INLAND WATERWAYS AUTHORITY OF INDIA

(MINISTRY OF SHIPPING, GOVT. OF INDIA)

A - 13, SECTOR - 1

NOIDA - 201301 (U.P.)

Phone : 0120-2521664, 2521704, 2544036; Fax : 0120-2521664, 2543973,
Website : www.iwai.nic.in ; E-mail : iwainoi@nic.in



INLAND WATERWAYS AUTHORITY OF INDIA
(Ministry of Shipping, Government of India)
A-13, SECTOR-1
NOIDA – 201 301 (U.P)

Phone : 0120-2521664, 2521704, 2544036; Fax : 0120-2544041, 2543973,
Web site : www.iwai.nic.in ; E mail : iwainoi@hub.nic.in

Tender No : IWAI/PR/Bldg/42/2011

Issued to : M/s.

Sub: Tender for construction of Vertical Expansion (upper floors from 2nd To 6th) at IWAI Office cum R & D Complex at A-13, Sector-1, Noida (SH: Civil, Water Supply & Sanitary Installation, Internal Electrical and Fire-Fighting works, etc.)

Ref : Your letter no.

Date

Sir,

With reference to your letter cited on the above-mentioned subject, please find enclosed herewith one set of tender document for the subject work. You are requested to go through the terms and conditions carefully and also visit / inspect the site to familiarize and submit your tender as per procedure explained in the tender document.

The last date for receipt of tender is 24.10.2011 upto 3.00 PM at IWAI, Noida and tender (Part-1 only) will be opened on 24.10.2011 at 3.30 PM at IWAI, Noida.

Issuance of tender document will not construe that such bidders are automatically considered qualified.

Chief Engineer
IWAI, Noida



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CONSTRUCTION OF VERTICAL EXPANSION
(UPPER FLOORS FROM 2nd TO 6th)
AT IWAI OFFICE CUM R & D COMPLEX AT
A-13, SECTOR-1, NOIDA

(SH:CIVIL, WATER SUPPLY & SANITARY INSTALLATION,
INTERNAL ELECTRICAL AND FIRE-FIGHTING WORKS, ETC.)

PART – I

TECHNICAL BID



INLAND WATERWAYS AUTHORITY OF INDIA
(Ministry of Shipping, Govt. of India)
A-13, SECTOR-1
NOIDA – 201301 (U.P)

NOTICE INVITING TENDER
Tender no. IWAI/PR/Bldg./42/2011

IWAI invites sealed tenders in two cover system from the eligible firms for the following work:-

Name of work	Estimated cost (Rs.)	EMD (Rs.)	Time for completion	Last Date of sale of Tender Document	Last date of receipt & opening of tender.
Construction of vertical expansion (upper floors from 2 nd to 6 th) at IWAI Office Cum R & D Complex at A-13, Sector-1, Noida (SH: Civil, water supply & sanitary installation, internal electrical and fire-fighting works etc.)	718.00 lakh	14.36 lakh	9 Months	21.10.2011	24.10.2011

ELIGIBILITY CRITERIA:-

- (i) The firm shall have valid registration in appropriate class with CPWD, MES, Railways, or any central/state Govt. organization.
- (ii) Satisfactory completion of at least three similar works each of value not less than Rs. 288.00 lakh or two similar works each of value not less than Rs. 360.00 lakh or one work of value not less than Rs. 575.00 lakh in last 7 years (year ending September, 2011).
- (iii) Similar work shall mean works of RCC framed structure of not less than 5 stories.
- (iv) The firm should have average annual financial turnover of Rs. 216.00 lakh of construction work during the last three years ending 31st March, 2011.
- (v) The firm should not have incurred loss for more than 2 years during preceding five years ending 31st March, 2011.
- (vi) The work involves civil, water supply & sanitary installation, internal electrical and firefighting works of the multi-storeyed building and the firm shall have experience in executing these works in single contract.
- (vii) The firm shall be working in the field of construction of similar works for the past 3 years consistently.
- (viii) The firm should have valid registration for service tax VAT and should have Permanent Account Number (PAN).

Parties fulfilling the above indicative eligibility criteria can purchase tender document from office of the Chief Engineer IWAI, A – 13, Sector – 1, Noida – 201301 by paying Rs. 1,500/- (Rupees One thousand five hundred only) in the form of non-refundable demand draft in favour of 'IWAI Fund' payable at Noida/New Delhi at any nationalized/scheduled bank on any working day from Monday to Friday during office hours between 9:30 to 18:00 hours up to the last date of issue of tender as indicated above. The tender document can also be downloaded from the IWAI's website "www.iwai.nic.in". Site can be inspected on all the working days during office hours. IWAI reserves the right to reject any or all the tender without assigning any reason thereof.

Sd/-
Chief Engineer



FORM OF TENDER

To,

The Chief Engineer,
Inland Waterways Authority of India,
A-13, Sector-1,
Noida – 201301 (U.P.)

Name of Work : Construction of Vertical Expansion (upper floors from 2nd to 6th) at IWAI Office cum R & D Complex at A - 13, Sector – 1, Noida. (SH: Civil, Water Supply & Sanitary installation, Internal Electrical and Fire-fighting works, etc.)

Sir,

1. Having visited the site and examined the General, Special and other Conditions of contracts, General specifications and Detailed specifications, Schedules and Bill of Quantities along with all appendix and annexure for the above work, I/We offer to execute the above said work in conformity with the said Conditions of Contract, Specifications, Schedule of quantities for the sum as stated in Bill of quantities of this tender Document or such other sum as may be ascertained in accordance with the said conditions of contract.

2. I/We undertake to complete and deliver the whole of the work comprised in the tender within the time as stated in the tender and also in accordance with the specifications, conditions and instructions as mentioned in the tender documents.

3. I/We have independently considered the amount of Liquidated Damages shown in the tender hereto and agree that it represents a fair estimate of the loss likely to be suffered by IWAI in the event of works not being completed in time.

4. I/We agree to abide by this tender. I/We agree to keep the tender open for a period of 90 days from the date of opening of price bids or extension thereto as required by the IWAI and not to make any modifications in its terms and conditions.

5. A sum or Rs.....(Rupees) is hereby forwarded in the form of Demand Draft no..... dated issued by (name & branch of bank) payable at as earnest Money. I/We agree, if I/We fail to keep the validity of the tender open as aforesaid or I/we make the modifications in the terms and conditions of my/our tender or I/we fail to commence the execution of the works as above then I/We shall become liable for forfeiture of my/our Earnest money, as aforesaid and IWAI shall without any prejudice to another right or remedy, be at the liberty to forfeit the said Earnest Money absolutely otherwise the said earnest money shall be retained by IWAI towards part of 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. Should this tender be accepted, I/We

agree to abide by and fulfill all the terms and conditions and provisions of this tender. No interest is payable on earnest money deposit and/or security deposit.

6. If this tender is accepted, I/We undertake to enter into, at my our cost when called upon by the employer to do so, a contract agreement in the prescribed form. Unless and until a formal agreement is prepared and extended this tender together with your acceptance thereto shall constitute a binding contract.

7. I/We agree that if my/our tender is accepted, I/We am/are to be jointly and severally responsible for the due performance of the contract.

8. I/We understand that you are not bound to accept the lowest or any tender you may receive and may reject all or any tender without assigning any reason.

9. I/We are enclosing herewith "Time Activity Schedule" so as to complete the work within stipulated time.

10. I/We certify that the tender submitted by me/us is strictly in accordance with the terms, conditions, specifications etc. as contained in the tender document, and it is further certified that it does not contain any deviation to the aforesaid documents.

Date

Signature

Name

Designation

duly authorized to sign & submit tender for an on behalf of

(Name and address of firm)

M/s

.....

.....

Telephone Nos.

FAX No.

Witness:

Signature:

Name :

Occupation:

Address:

.....

Telephone nos.:



INSTRUCTION FOR SUBMISSION OF BID

1. All covering letters and information to be included in the bid shall be submitted along with the bid itself.
2. Tender should be submitted in two covers viz. separate sealed Envelope-1 (containing technical bid) and Envelope-2 (containing price bid) and both of these covers should be placed in an envelope duly superscribing clearly the name of the work “**BID FOR CONSTRUCTION OF VERTICAL EXPANSION (UPPER FLOORS FROM 2nd TO 6th) AT IWAI OFFICE CUM R & D COMPLEX AT A-13, SECTOR-1, NOIDA (SH: CIVIL, WATER SUPPLY & SANITARY INSTALLATION, INTERNAL ELECTRICAL AND FIRE-FIGHTING WORKS ETC.)** and “**TO BE OPENED BY THE ADDRESSEE ONLY**” written prominently. The full name, postal address and Telex/telegraphic address of the Bidder shall be written on the bottom left hand corner of the sealed envelope. Further envelope containing each part shall be superscripted as under:
3. The first cover/envelope containing Part-1 shall be submitted along with the following documents and the cover should be superscribed with “**ENVELOPE-1 : TECHNICAL BID FOR CONSTRUCTION OF VERTICAL EXPANSION (UPPER FLOORS FROM 2nd TO 6th) AT IWAI OFFICE CUM R & D COMPLEX AT A-13, SECTOR-1, NOIDA (SH: CIVIL, WATER SUPPLY & SANITARY INSTALLATION, INTERNAL ELECTRICAL AND FIRE-FIGHTING WORKS ETC.)**”:
 - a) Original bid document duly filled in and completed in all respects except prices, signed with rubber seal on each page as a proof of acceptance.
 - b) Earnest Money Deposit (Demand Draft)
 - c) Memorandum of Association & Article of Association/Partnership deeds, as applicable.
 - d) Copy of document in proof of registration in appropriate class with CPWD, MES, Railways, or any Central/State Govt. organization.
 - e) Description of the bidders works experience of similar nature during last seven years along with documentary proof (ending September 2011).
 - f) Balance Sheet and the Profit & Loss Account together with Tax Audit Report duly certified by a firm of Chartered Accountant for the last 3 financial years.
 - g) Bidder shall furnish list of the supervisory persons and other technical persons he wish to deploy in this job along with their experience details.
 - h) Letter of Authority for signing and negotiation of bid.
 - i) Document in the respect of PAN, service tax, VAT number/registration.
 - j) Solvency certificate from any nationalized /scheduled bank.
 - k) Receipted copy of the return of Income filed with Income Tax Authority for last 3 years.
 - l) Receipted copy of Return of Employees Provident Fund (EPF) for last three years.
 - m) Integrity Pact duly signed .
 - n) Any additional relevant information to be furnished by the bidder.

The Second cover containing Part-2 shall be submitted along with the following documents and the cover should be superscribed with “**ENVELOPE-2 : PRICE BID FOR CONSTRUCTION OF VERTICAL EXPANSION (UPPER FLOORS FROM 2nd TO 6th) AT IWAI OFFICE CUM R & D COMPLEX AT A-13, SECTOR-1, NOIDA (SH: CIVIL, WATER SUPPLY & SANITARY INSTALLATION, INTERNAL ELECTRICAL AND FIRE-FIGHTING WORKS ETC.)**”:

- a) Schedule of prices duly filled in.

It may please be noted that:-

- (a) The price bid part shall not contain any terms and conditions whatsoever. These, if any, must be brought out in Part- I only. Any condition given in the price bid will not be taken into account and it will be sufficient cause for rejection of bid.
 - (b) Price bids of only those bidders whose technical and commercial proposals are complete and found acceptable, shall be opened in the presence of bidders or their authorized representatives who may like to be present, on a suitable date to be intimated to such tenderers separately.
4. Bidders are advised to submit their offers strictly based upon the detail terms and conditions contained in “INSTRUCTION TO BIDDERS” being a part of this tender document and not to stipulate any deviations. Should it, however, become unavoidable, deviations should be stipulated in part – I of the tender. IWAI reserves the right to evaluate bids containing such deviations and accept or reject any part or whole of the same without showing any reason whatsoever.
 5. IWAI reserves the right to reject any or all bids without assigning any reasons.
 6. Bids received late at IWAI’s office after the stipulated last date and time for receipt of bids due to any reason whatsoever, will not be considered. Bids shall be adjudged as non-responsive due to any of the following reasons:
 - (a) Bids submitted after the due date and time.
 - (b) Bids submitted without Earnest money,
 - (c) Bids submitted without certificate(s) in respect of the financial and technical qualification criteria.
 - (d) Bids submitted without documents to establish the eligibility criteria.
 - (e) Bids submitted without photocopies of the receipted copies of VAT, IT and PF Returns from the respective Competent Authority.
 - (f) Qualified Price Bid.
 - (g) Any other reason as applicable.

7. The bid can only be submitted in the name of the bidder in whose name the bid documents are issued by IWAI.
8. Any annotation or accompanying documentation in the bid shall be in Hindi or English language only and in metric system. Bid filled in any other language will be summarily rejected.
9. The firms interested in the work must have a good track record and must not have been black-listed by any Government Organization/ PSUs / Statutory Body / Major Ports in course of last 5 years. Bids of such black listed firms will not be considered by the Authority. The intending tenderers must have positive networth as on 31.03.2011. This fact should be certified by a Chartered Accountant. The tenderer must also submit banker's certificate along with the offer regarding the financial credibility/solvency of the firm.
10. Bidder shall sign their proposal with the exact name of the firm to whom the bid document has been issued. The bid shall be duly signed and sealed by an authorized person of the bidders' organization as following:
 - (a) If the Tender is submitted by an individual, it shall be signed by the proprietor above his full name and full name of his firm with its current business address.
 - (b) If the Tender is submitted by the proprietary firm, it shall be signed by the proprietor above his full name and full name of his firm with its name and current business address.
 - (c) If the Tender is submitted by a firm in partnership, it shall be signed by all the partners of the firm above, their full names and current business address, or by a partner holding the power of attorney for the firm for signing the Tender in which cases a certified copy of the power of attorney shall accompany the Tender. A certified copy of the partnership deed and current business address of all the partners of the firm shall also accompany the Tender.
 - (d) If the Tender is submitted by a limited company, or a limited Corporation, it shall be signed by a duly authorized person holding the power of attorney for signing the tender in which case a certified copy of the power of attorney shall accompany the Tender. Such limited company or corporation may be required to furnish satisfactory evidence of its existence before the contract is awarded. 'Satisfactory evidence' means the certificate of incorporation of the limited company or corporation under Indian Companies Act, 1956.
 - (e) Two or more firms interested in work may also submit joint bid. In such case, all the firms have to submit a memorandum of understanding alongwith the joint bid. In that case, the lead partner will sign all tender documents. The sponsoring firm/lead partner shall submit complete information pertaining to each firm in the group and state along with the bid as to which of the firm shall have the responsibility for tendering and for completion of the contract document and furnish evidence admissible in law in respect of the authority assigned to such firm on behalf of the

group of firms for tendering and for completion of the contract document. The full information and satisfactory evidence pertaining to the participation of each member of the group of firm in the firm in the Tender shall be furnished alongwith the Tender.

11. Bidders shall clearly indicate their legal constitution and the person signing the bid shall state his capacity and also the source of his ability to bind the bidder. The power of attorney or authorization or any other document constituting adequate proof of the ability of the signatory to bind the bidder shall be annexed to the bid. The owner may reject outright any bid unsupported by inadequate proof of the signatory's authority.
12. The bid document shall be completed in all respects and shall be submitted together with the requisite information and appendices. They shall be completed and free from ambiguity, change or inter-lineation.
13. If the space in the bid form or in the Appendices thereto is insufficient, additional pages shall be separately added. These pages shall be page numbered & signed by the Bidder.
14. Bidder shall set their quotation in firm figures and without qualification. Each figure stated should also be repeated in words and in the event of any discrepancy between the amounts stated in figures and words, the amount quoted in words shall be deemed the correct amount. Bid containing qualifying expressions such as "subject to minimum acceptance" or "subject to availability of material / equipment" etc. is liable to be rejected.
15. IWAI shall have a unqualified option under the said bid bond to forfeit the EMD in the event of Bidder failing to keep the bid valid upto the date specified or refusing to accept work or carry it out in accordance with the bid if the IWAI decides to award the work to the Bidder.
16. IWAI shall, however, release the EMD in respect of unsuccessful bidders within 30 (thirty) days of placement of order to successful bidder. EMD of successful bidder will be converted into security refundable deposit. In case of any breach of contract, EMD will be forfeited.
17. The EMD shall be retained with the IWAI until finalization of tenders. Further, security deposit as per the clause of Security shall be payable by the successful bidder. If the tenderer fails to furnish the security deposit or performance guarantee in accordance with tender conditions, EMD shall be forfeited. In the event of the Bidder becoming the successful Contractor. The amount of EMD would be adjusted against the Security deposit.
18. IWAI shall, however, arrange to release the EMD in respect of unsuccessful bidders within 30 (thirty) days of placement of order to successful bidder. No interest shall be payable on EMD by IWAI.



GENERAL CONDITIONS

Integrity Pact

To,

M/s
.....
.....

Sub:- NIT No. IWAI/PR/Bldg/42/2011 for the work of Construction of Vertical Expansion (upper floors from 2nd to 6th) at IWAI Office cum R & D Complex at A - 13, Sector – 1, Noida. (SH: Civil, Water Supply & Sanitary installation, Internal Electrical and Fire-fighting works, etc.)

Dear Sir,

It is hereby declare that IWAI is committed to follow the principle of transparency, equity and competitiveness in public procurement.

The subject Notice Inviting Tender (NIT) is an invitation to offer made on the condition that the Bidder will sign the integrity Agreement, which is an integral part of tender/bid documents, failing which the tenderer/bidder will stand disqualified from the tendering process and the bid of the bidder would be summarily rejected.

This declaration shall form part and parcel of the Integrity Agreement and signing of the same shall be deemed as acceptance and signing of the Integrity Agreement on behalf of the IWAI.

Yours faithfully

Chief Engineer

To,

The Chief Engineer,
Inland Waterways Authority of India,
A-13, Sector-1,
Noida – 201301 (U.P.)

Sub: Submission of Tender for the Work for Construction of Vertical Expansion (upper floors from 2nd to 6th) at IWAI Office cum R & D Complex at A - 13, Sector – 1, Noida. (SH: Civil, Water Supply & Sanitary installation, Internal Electrical and Fire-fighting works, etc.)

Dear Sir,

I/We acknowledge that IWAI is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process.

I/We acknowledge that the making of the bid shall be regarded as an unconditional and absolute acceptance of this condition of the NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by IWAI. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, IWAI shall have unqualified, absolute and unfettered right to disqualify the tenderer/bidder and reject the tender/bid in accordance with terms and conditions of the tender/bid.

Yours faithfully

(Duly authorized signatory of the Bidder(s))

To be signed by the bidders' and same signatory competent/authorised to sign the relevant contract on behalf of IWAI.

INTEGRITY AGREEMENT

This Integrity Agreement is made at on thisday of 20.....

BETWEEN

Chairperson, Inland Waterways Authority of India represented through Chief Engineer, Inland Waterways Authority of India, A - 13, Sec. – 1, Noida.

IWAI, (Hereinafter referred as the 'Principal/Owner', which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

AND

.....
(Name and Address of the Individual/firm/Company)
through(Hereinafter referred to as the
(Details of duly authorized signatory)
"Bidder/Contractor" and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

Preamble

WHEREAS the Principal / Owner has floated the Tender (NIT No. IWAI/PR/Bldg/42/2011) (hereinafter referred to as "Tender/Bid") and intends to award, under laid down organizational procedure, contract for "Construction of vertical expansion (upper floors from 2nd to 6th) at IWAI office cum R & D Complex at A - 13, Sector – 1, Noida (SH: civil, water supply & sanitary installation, internal electrical and fire-fighting works etc.)" hereinafter referred to as the "Contract".

AND WHEREAS the Principal/Owner values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Bidder(s) and Contractor(s).

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as "Integrity Pact" or "Pact"), the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesses as under:

Article 1: Commitment of the Principal/Owner

- 1) The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:
 - (a) No employee of the Principal/Owner, personally or through any of his/her family members, will in connection with the Tender, or the execution of the Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
 - (b) The Principal/Owner will, during the Tender process, treat all Bidder(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the Tender process or the Contract execution.
 - (c) The Principal/Owner shall endeavour to exclude from the Tender process any person, whose conduct in the past has been of biased nature.
- 2) If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal code (IPC)/Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the Chief Vigilance Officer and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

Article 2: Commitment of the Bidder(s)/Contractor(s)

1. It is required that each Bidder/Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to the IWAI all suspected acts of fraud or corruption or Coercion or Collusion of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.
2. The Bidder(s)/Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:
 - a) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal/Owner's employees involved in the tender process or execution of the contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the contract.
 - b) The Bidder(s)/Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.

- c) The Bidder(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Bidder(s)/Contract(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
 - d) The Bidder(s)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/representatives in India, if any. Similarly Bidder(s)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representatives, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases where an agent participate in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.
 - e) The Bidder(s)/Contractor(s) will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.
3. The Bidder(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.
 4. The Bidder(s)/Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice means a wilful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to the detriment of the Government interests.
 5. The Bidder(s)/Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/ her reputation or property to influence their participation in the tendering process).

Article 3: Consequences of Breach

Without prejudice to any rights that may be available to the Principal/Owner under law or the Contract or its established policies and laid down procedures, the Principal/Owner shall have the following rights in case of breach of this Integrity Pact by the Bidder(s)/Contractor(s) and the bidder/contractor accepts and undertakes to respect and uphold the Principal/Owner's absolute right:

1. If the Bidder(s)/Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner after giving 14 days'

notice to the contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the tender process or terminate/determine the Contract, if already executed or exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal/Owner. Such exclusion may be forever or for a limited period as decided by the Principal/Owner.

2. Forfeiture of EMD/Performance Guarantee/Security Deposit: If the Principal/Owner has disqualified the Bidder(s) from the tender process prior to the award of the contract or terminated/determined the contract or has accrued the right to terminate/determine the contract according to Article 3(1), the Principal/Owner apart from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion forfeit the entire amount of Earnest Money Deposit, Performance Guarantee and Security Deposit of the Bidder/Contractor.
3. Criminal Liability: If the Principal/Owner obtains knowledge of conduct of a bidder or Contractor, or of an employee or a representative or an associate of a bidder or Contractor which constitutes corruption within the meaning of IPC Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to law enforcing agencies for further investigation.

Article 4: Previous Transgression

- 1) The Bidder declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anticorruption approach or with Central Government or State Government or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.
- 2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/ holiday listing of the Bidder/Contractor as deemed fit by the Principal/ Owner.
- 3) If the Bidder/Contractor can prove that he has resorted / recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion, revoke the exclusion prematurely.

Article 5: Equal Treatment of all Bidders/Contractors/Subcontractors

- 1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Subcontractors/ sub-vendors.
- 2) The Principal/Owner will enter into Pacts on identical terms as this one with all Bidders and Contractors.

- 3) The Principal/Owner will disqualify Bidders, who do not submit, the duly signed Pact between the Principal/Owner and the bidder, along with the Tender or violate its provisions at any stage of the Tender process, from the Tender process.

Article 6- Duration of the Pact

This Pact begins when both the parties have legally signed it. It expires for the Contractor/Vendor 12 months after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other bidders, till the Contract has been awarded.

If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pacts as specified above, unless it is discharged/determined by the Competent Authority, IWAI.

Article 7- Other Provisions

- 1) This Pact is subject to Indian Law, place of performance and jurisdiction is the Headquarters of the Division of the Principal/Owner, who has floated the Tender.
- 2) Changes and supplements need to be made in writing. Side agreements have not been made.
- 3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.
- 4) Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Owner/Principal in accordance with this Integrity Agreement/ Pact or interpretation thereof shall not be subject to arbitration.

Article 8- LEGAL AND PRIOR RIGHTS

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Integrity Pact will have precedence over the Tender/Contact documents with regard any of the provisions covered under this Integrity Pact.

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and date first above mentioned in the presence of following witnesses:

.....
(For and on behalf of Principal/Owner)

.....
(For and on behalf of Bidder/Contractor)

WITNESSES:

1.
(signature, name and address)

2.
(signature, name and address)

Place:

Date :

SCHEDULES

- SCHEDULE 'A' : Schedule of quantities** - **(Enclosed)**
SCHEDULE 'B' : Schedule of materials to be issued to the contractor - **Not applicable**
SCHEDULE 'C' : Tools and plats to be hired to the contractor. - **Not applicable**
SCHEDULE 'D' : Extra schedule for specific requirements/document for the work, if any. - **Not applicable**
SCHEDULE 'E' : Reference to General Conditions of contract.

Name of Work : CONSTRUCTION OF VERTICAL EXPANSION (UPPER FLOORS FROM 2nd TO 6th) AT IWAI OFFICE CUM R & D COMPLEX AT A - 13, SECTOR – 1, NOIDA (SH: CIVIL, WATER SUPPLY & SANITARY INSTALLATION, INTERNAL ELECTRICAL AND FIRE-FIGHTING WORKS ETC.)

Estimated cost of work: The work is estimated to cost Rs. 718 lacs.
This estimate, however, is given merely as a rough guide.

- (a) **Earnest Money** : Rs. 14.36 lacs
(b) **Performance Guarantee** : 5% of tendered value.
(c) **Security Deposit** : 5% of tendered value.

SCHEDULE 'F' : General Rules & Directions: -

Officer inviting tender: - **The Chief Engineer , IWAI, NOIDA.**

Maximum percentage for quantity of items of work to be executed beyond which rates are to be determined in accordance with Clauses 12.2 & 12.3. 30% (Thirty Percent).

Definitions: -

- 2(v) Engineer-in-charge The Chief Engineer, IWAI, NOIDA.
2(viii) Accepting Authority: The Chairperson, IWAI, NOIDA.
2 (x) Percentage on cost of materials and labour to cover all overheads and profits 15%
2(xi) Standard Schedule of Rate DSR 2007 (Reprint- 2010) plus 49% cost index on civil DSR items and plus 60% cost index on electrical DSR items and market rates.
2(xii) Department IWAI,A-13,Sec-1,Noida.

Clause 1

i) Time allowed for submission of performance Guarantee from the date of issue of letter of acceptance 15days

ii) Maximum allowable extension beyond the Period provided in i) above **7days**
(on written request of the contractor stating the reason for delays in procuring the performance guarantee to the satisfaction of the Engineer-in-charge).

Clause 2 - Compensation for delay

Authority for fixing Compensation under clause- 2. **Chief Engineer, IWAI,NOIDA**

Clause 2A- Incentive for early completion

Whether Clause 2A shall be applicable **No**

Clause 5- Time and Extension for delay

Number of days from the date of issue of letter of Acceptance for reckoning date of start **22 Days**

Milestone(s) as per Table given below :-

TABLE OF MILESTONES

Sl. no	Milestone Programme	Time allotted (from date of start) in months	Amount to be withheld in case of non-achievement of milestone
1.	Structural work 2nd floor slab for both the blocks.	1.5	0.25% of tendered amount
2.	Structural work up to 3 rd floor slab & internal masonry, doors & windows frames and external stone cladding up to 2 nd floor level and flooring and finishing of basement of first blocks.	1	0.25% of tendered amount
3.	Structural work up to 4th floor slab & internal masonry, doors & windows frames and external stone cladding up to 3rd floor level and flooring and finishing of basement of first blocks	1	0.25% of tendered amount
4.	Structural work up to 5th floor slab & internal masonry, doors & windows frames and external stone cladding up to 4th floor level and flooring and finishing of basement of first blocks.	1	0.25% of tendered amount
5.	Structural work up to 6th floor slab & internal masonry, doors & windows frames and external stone cladding up to 5th floor level and flooring and finishing of basement of first blocks.	1	0.25% of tendered amount
6.	Internal and external finishing and all services	2.5	0.25% of tendered amount
7.	Commissioning and testing of services and handing over.	1	0.50% of tendered amount

Time allowed for execution of work : **09 (Nine) Months**

Authority to decide:

(i) Extension of time : **The Chairperson, IWAI, NOIDA.**
(ii) Rescheduling of mile stones : **The Chairperson, IWAI, NOIDA.**

Clause 6, 6A - Measurements of work done

Clause applicable (6 or 6A) : **Only clause 6 applicable.**

Clause 7 -Payment on intermediate certificate to be regarded as Advances

Gross work to be done together with net : **Rs. 30Lakh**
payment/adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment.

Clause 10 A- Materials to be provided by the contractor

List of testing equipment to be provided by the contractor: **As per list mentioned in special conditions of contract**
at site lab

Clause 10 B (ii) -Mobilisation Advance

Whether Clauses 10 B (ii) shall be applicable : **Yes**

Clause 10 C : **Not applicable**

Clause 10 CA : **Not Applicable**

Clause 10 CC : **Not applicable**

Clause 11

Specification to be followed : **CPWD Specifications 2009 Vol. I to II correction slips up to 30.09-2011.**

Clause 12

12.2 & 12.3 Deviation Limit beyond which clauses 12.2 & 12.3 shall apply **30% (Thirty) Percent.**

12.5 Deviation Limit beyond which clauses 12.2 & 12.3 shall apply for foundation work. **Not Applicable**

(Foundation work shall include all items up to 1.2 m above general ground level as decided by Engineer-in-Charge)

Clause 16

Competent Authority for deciding reduced rates: **Chief Engineer, IWAI, NOIDA**

Clause 18**List of mandatory machinery, tools & plants to be deployed by the contractor at site:-**

- | | | | |
|-----------------------------------|----------|----------------------------------|---------|
| 1. Tower Crane of min 35 M height | - 1 no. | 2. Weigh batcher | - 1 no. |
| 3. Concrete Mixer with hopper | - 2 nos. | 4. Generators | - 1 no. |
| 5. Needle Vibrators | - 4 nos. | 6. Bar bending machine. | - 1 no. |
| 7. Drilling machines | - 2 nos. | 8. Bar cutting machines | - 1 no. |
| 9. Welding machines | - 1 no. | 10. Dumpy level | - 1 no. |
| 11. Theodolite | - 1 no. | 12. Steel Shuttering – 1000 Sqm. | |
- and other T&P as required and as directed by Engineer-in-charge.

For ready mix concrete, transit mixers and concrete pumps shall be used as per requirement.

Clause 36 (i).**Requirement of Technical representative (s) & Recovery Rate.**

Sl. no	Minimum Qualification of Technical representative	Discipline	Designation (Principal technical /technical representative)	Minimum experience	Number	Rate which recovery shall be made from the contractor in the event of not fulfilling provision of class 36(i)	
						Figures (Rs)	Words (Rupees)
1	Graduate Engineer	Civil	Principal technical representative	10 years	1	50,000/-	Fifty thousand only (per month)
2.	Graduate Engineer or Diploma holder	Civil	Technical representative	5 years or 10 years	1	35,000/-	Thirty Five thousand only (per month)
3	Graduate Engineer or Diploma holder	Electrical	Technical representative	2 years or 7 years	1	25,000/-	Twenty Five thousand only (per month)

Assistant Engineers retired from Government services that are holding Diploma will be treated at par with Graduate Engineers.

Clause 42

- i) (a) Schedule/statement for determining theoretical quantity of cement, steel & bitumen on the basis of : Delhi Schedule of Rates 2007 Re-printed-2010
- ii) Variations permissible on theoretical quantities.
- a) Cement : 2% plus/minus.
- b) Steel Reinforcement and structural steel Sections for each diameter, section and Category. : 2% plus/minus
- c) Bitumen : 2.5% plus only and nil on minus side.
- d) All other materials. : Nil

RECOVERY RATES FOR QUANTITIES BEYOND PERMISSIBLE VARIATION

Recovery for less use of items shall be at double of the basic cost as following which is based on the indices issued by CPWD on 16.9.2011

Sl. no.	Description of Item	Rates in figures and Words at which recovery shall be made from the Contractor	
		Excess beyond permissible variation	Less use beyond permissible variation
1.	Cement	-	Rs.87406/- per metric ton
2.	Steel Reinforcement		
(i)	Primary manufacturers	-	Rs.94000/- per metric ton
(ii)	Secondary manufacturers	-	Rs.79800/- per metric ton
3.	Structural Sections	-	Rs.87406/- per metric ton

GENERAL RULES AND DIRECTION

1. All work proposed for execution by contract 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 Newspapers 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 with the tender, 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 bills. Copies of the specifications, designs and drawings and any other documents required in connection with the work signed for the purpose of identification 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. 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 authorizing 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.
3. Receipts for payment 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.
4. 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 conditions 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. Tender shall have the name and number of the works to which they refer, written on the envelopes.

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

5. The officer inviting tender or his duly authorized assistant will open tenders in the presence of any intending contractors who may be present at the time, and will enter the amounts 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 contractor who shall thereupon for the purpose of identification sign copies of the specifications and other documents mentioned in Rule-I. In the event of a tender being rejected, the earnest money shall thereupon be returned to the contractor remitting the same, without any interest.
6. 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 or any other tender.

7. The receipt of an accountant or clerk for any money paid by the contractor will not be considered as any acknowledgment or payment to the officer inviting tender and the contractor shall be responsible for seeing that he procures a receipt signed by the officer inviting tender or a duly authorized officer.
8. 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.
9. The tenderers shall sign a declaration under the officials 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.
- 9A. Use of correcting fluid, anywhere in tender document is not permitted. Such tender is liable for rejection.
10. In the case of Item Rate Tenders, only rates quoted shall be considered. Any tender containing percentage below/above the rates quoted is liable to be rejected. Rates quoted by the contractor in item rate tender in figures and words shall be accurately filled in so that there is no discrepancy in the rates written in figures and words. However, 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. If the amount of an item is not worked out by the contractor or it does not correspond with the rates written either in figures or in words, then the rates quoted by the contractor in words shall be taken as correct. Where the rates quoted by the contractor in figures and in words tally, but the amount is not worked out correctly, the rates quoted by the contractor will unless otherwise proved be taken as correct and not the amount. 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. In the case of any tender where unit rate of any item/items 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. All rates shall be quoted on the 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 words. In case of figures, the word 'Rs.' should be written before the figure 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 and 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.

- 13 (i) The Contractor whose tender is accepted, will be required to furnish performance guarantee of 5% (Five Percent) of the tendered amount within the period specified in schedule F. This performance guarantee shall be submitted in the form of demand draft or bank guarantee of any nationalized/ scheduled bank in the prescribed format.
- 13 (ii) The contractor whose tender is accepted will also be required to furnish by way of Security Deposit for the fulfilment of his contract, an amount equal to 5% of the tendered value of the work. The Security deposit will be collected by deductions 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 a part of the Security Deposit.
14. 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 Engineer-in-Charge.
15. Sales-tax/VAT (except service tax), purchase tax, turnover tax or any other tax applicable in respect of this contract shall be payable by the Contractor and IWAI will not entertain any claim whatsoever in respect of the same. 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.
16. 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.
17. The tender for composite work includes, in addition to building work, all other works such as sanitary and water supply installations drainage installation, electrical work, fire-fighting work etc. The tenderer apart from being a registered contractor of appropriate class, must associate himself with agencies of appropriate class which are eligible to tender for sanitary and water supply drainage, electrical and fire-fighting work in the composite tender.

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 Chairman, Inland Waterways Authority of India and the contractor, together within the documents referred to therein including these conditions, the specification, 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 expressions shall, unless the context otherwise requires, have the meanings, hereby respectively assigned to them:
 - (i) The expression '**work or works**' shall unless there be something either in the subject or context repugnant to such constructions be construed or taken to mean the works by or by virtue of the contract contracted to be executed whether temporary or permanent, and whether original offered substituted or additional.
 - (ii) The **Site** shall mean IWAI office cum R & D Complex building at A-13, Sector-1, Noida (U.P.) and on which the works are to be executed under this contract.
 - (iii) The '**Contractor**' shall mean the individual, firm of company, whether incorporated or not, undertaking the works and shall include the legal personal representative of such individual or the persons composing such firm or company, or the successors of such firm or company and the permitted assigns of such individual, firm or company.
 - (iv) The '**Employer**' means the Chairperson/Chairman, Inland Waterways Authority of India and his successors or assigns.
 - (v) The '**Engineer-in-charge**' means the Chief Engineer of the IWAI who shall supervise and be in charge of the work and who shall sign the contract on behalf of the Employer.
 - (vi) '**IWAI/Authority/Department/Owner**' shall mean the Inland Waterways Authority of India, which invited tenders on behalf of the Chairperson, IWAI.
 - (vii) '**Engineer-in-charge representative**' shall mean any officer of the Authority nominated by the Secretary to work on his behalf for supervision, checking, tasking measurement, checking bills, ensuring quality control, inspecting works, issue instructions and other related works for completion of the project.
 - (viii) Accepting Authority shall mean Competent Authority as per "Delegation of Powers".
 - (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 of usurped power,

any act of Govt. damages, acts of God, such as earthquake, lightening and unprecedented flood 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 Govt. of the part of the works in respect of which a certificate of completion has been issued or a cause solely due to Govt., faulty design of works.

- (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 or the standard Schedule of Rates of the government mentioned in Schedule 'F' hereunder, with the amendments thereto issued upto the date of receipt of the tender.
 - (xii) Department means Inland Waterways Authority of India (IWAI)
 - (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.
 - (xv) Date of commencement of work: The date of commencement of work shall be the date of start as specified in schedule 'F' or the first date of handing over of the site, whichever is later, in accordance with the phasing if any, as indicated in the tender document.
 - (xvi) The term 'Day' shall mean a calendar day beginning and ending at midnight.
 - (xvii) The term 'Week' shall mean seven consecutive calendar days.
 - (xviii) The term 'Month' shall mean the English calendar month.
3. 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 and Marginal notes to these General Conditions 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 Rates 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. 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 recognized principles.
7. 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. The several documents forming the Contract 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 conditions in preference to General Conditions.
- 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 Specification and Special Condition, if any.
 - (iii) Drawings.
 - (iv) CPWD Specifications.
 - (v) 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.
9. 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 IWAI Form as mentioned in Schedule 'F' consisting of:
 - a) Various standard clauses with corrections up to the date stipulated in Schedule 'F' along with annexures thereto.
 - b) IWAI Safety Code.
 - c) Model Rules for the protection of health, sanitary arrangements for workers employed by IWAI or its contractors.
 - d) IWAI Contractor's Labour Regulations.
 - e) List of Acts and omission for which fines can be imposed.
- (iii) No payment for the work done will be made unless contract is signed by the contractor.

CLAUSES OF CONTRACT

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, (notwithstanding 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 up to 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 Cash (in case guarantee amount is less than Rs. 10,000/-) or Deposit at Call receipt of any scheduled bank/Banker's Cheque of any scheduled bank/Demand Draft of any scheduled bank/Pay Order of any scheduled bank (in case guarantee amount is less than Rs. 1,00,000/-).
(Performa enclose at Annexure - V)
- ii) The Performance Guarantee shall be initially valid up to 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 Chairperson, IWAI 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 Chairperson, IWAI 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.

In the event of the contract being determined or rescinded under provision 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 Chairperson, IWAI.

CLAUSE 1 A : Recovery of Security Deposit

The person/persons whose tender(s) may be accepted (hereinafter called the contractor) shall permit IWAI 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 along with the sum already deposited as earnest money, will amount to security deposit of 5% 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 will be made and held by IWAI by way of Security Deposit.

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 Government on account of such breach, pay as agreed compensation the amount calculated at the rates 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.

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.

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this. 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 milestone(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 2A : Incentive for early completion -- Not Applicable

CLAUSE 3 : When contract can be Determined

Subject to other provisions contained in this clause, the Engineer-in-Charge may, without prejudice to his any other rights or remedy against the contractor in respect of any delay, inferior workmanship, any claims for damages and/or any other provisions of this contract or otherwise, and whether the date of 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 unworkman like manner shall omit to comply with the requirement of such notice for a period of seven 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 continues to do so after a notice in writing of seven 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 IWAI 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 contract .
- vi) If the contractor shall enter into a contract with IWAI 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 IWAI as a result of wrong tendering or other non-bonafide methods of competitive tendering or commits breach of integrity pact.
- 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 accreditor 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

When the contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge on behalf of the Chairperson, IWAI 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 IWAI.
- (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 un-executed 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 reasons 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 provision 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 :

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, clerk of the works, foreman or other authorized 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 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 specified 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, IWAI 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 IWAI. 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) 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 lockout, 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 or break down of tools and Plant to be supplied or supplied by IWAI or
- (vii) 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 authority as indicated in Schedule 'F' 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 fourteen days of the happening of the event causing delay on the prescribed form to the authority as indicated in Schedule 'F'. The Contractor may also, if practicable, indicate in such are quest the period for which extension is desired.

5.4 In any such case the authority as indicated in Schedule 'F' 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 authority as indicated in Schedule 'F' 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 authority as indicated in Schedule 'F' 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 authorized representative and by the contractor or his authorized 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 authorized 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 authorized representative does not remain present at the time of such measurements after the contractor or his authorized 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 seven days' notice to the Engineer-in-Charge or his authorized 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 authorized 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 authorized 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 6A : Computersied measurement books - Not Applicable

CLAUSE 7 : Payment on intermediate certificate to be regarded as advance

No payment shall be made for work, estimated to cost Rupees Twenty thousand or less till after the whole of the work shall have been completed and certificate of completion given. For works estimated to cost over Rupees Twenty thousand, the interim or running account bills 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 measurements 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.

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 in his sole discretion on the basis of a certificate from the authorised representative to the effect that the work has been completed up to the level in question make interim advance payments without detailed measurements for work done (other than foundations, items to be covered under finishing items) up to 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.

In case main contractor fails to make the payment to the contractor associated by him within 15 days of receipt of each running account payment, then on the written complaint of contractor associated for such minor component, Engineer in charge of minor component shall serve the show cause to the main contractor and if reply of main contractor either not received or found unsatisfactory, he may make the payment directly to the contractor associated for minor component as per the terms and conditions of the agreement drawn between main contractor and associate contractor fixed by him. Such payment made to the associate contractor shall be recovered by Engineer-in-charge of major or minor component from the next R/A/ final bill due to main contractor as the case may be.

CLAUSE 8 : Completion Certificate and 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 final 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 is/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, floor or other parts of 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 work, the Engineer-in-Charge may at the expense of the contractor remove such scaffolding, surplus materials and rubbish etc., and dispose of 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 realized by the sale thereof.

CLAUSE 8A : Contractor to Keep Site Clean

When the annual repairs and maintenance of works are carried out, the splashes and droppings from white washing, colour washing, painting etc., on walls, floor, 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 the 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 ten days' notice in writing to the contractor.

CLAUSE 8B : Completion Plans to be Submitted by the Contractor

The contractor shall submit completion plan as required vide General Specifications for Electrical works (Part-I internal) 2005 and (Part-II External) 1994 as applicable within thirty 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 2.5% of the value of the work subject to a ceiling of Rs.15,000 (Rs. Fifteen thousand only) as may be fixed by the chief Engineer concerned and in this respect the decision of the chief Engineer 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 authorized representative, complete with account of materials issued by the Department and dismantled materials.

- (i) If the Tendered value of work is up to Rs. 15 lac : 3 months
- (ii) If the Tendered value of work exceeds Rs. 15 lac : 6 months

CLAUSE 9A : Payment of Contractor's Bill 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 authorization 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 IWAI or his signature on the bill or other claim preferred against IWAI 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 whenever 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 Chairperson, IWAI.

CLAUSE 10 : Materials supplied by Government - Not applicable

CLAUSE 10A :Materials to be provided by the Contractor

The contractor shall, at his own expense, provide all materials, required for the works.

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 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 authorized 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 at least with the testing equipment as specified in schedule F.

CLAUSE 10B: Secured Advance on Non-perishable Material

- (i) 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 the 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) 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 utilization 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) An advance for plant, machinery & shuttering material required for the work.**Not applicable**
- (iv) The mobilization advance in (ii) above bear simple interest at the rate of **10** per cent 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 ten per cent 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 eighty per cent of the gross value of the contract is executed and paid, together with interest due on the entire outstanding amount up to the date of recovery of the installment.
- (v) If the circumstances are considered reasonable by the Engineer-in-Charge, the period mentioned in (ii) for request by the contractor in writing for grant of mobilization advance may be extended in the discretion of the Engineer-in-Charge.

CLAUSE 10C : Not applicable

CLAUSE 10 CA : Not applicable

CLAUSE 10 CC : Not applicable

CLAUSE 10 D :Dismantled Material Govt. Property

The contractor shall treat all materials obtained during dismantling of a structure, excavation of the site for a work, etc. as Authority's/Government's property and such materials shall be disposed off to the best advantage of Authority 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 workmanlike 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 design, 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 specified in Schedule 'F' or in any Bureau of Indian Standard or any other, published standard or code or, Schedule of Rates 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.

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 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.

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.

- (a) 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).

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 fifteen 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 fifteen 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 fifteen days having regard to the market rates.
- 12.4 The contractor shall send to the Engineer-in-Charge once every three months, an up to 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 Superintending Engineer 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 unless & otherwise defined in the contractor:
 - (i) For Buildings : All works up to 1.2 metres above ground level or up to floor 1 level whichever is lower.

- (ii) For abutments, piers and well staining : All works up to 1.2 m above the bed level.
- (iii) For retaining walls, wing walls, compound walls, chimneys, overhead reservoirs/tanks and other elevated structures: All works up to 1.2 metres above the ground level.
- (iv) For reservoirs/tanks (other than overhead reservoirs/tanks): All works up to 1.2 metres above the ground level.
- (v) For basement: All works up to 1.2 m above ground level or up to floor 1 level whichever is lower.
- (vi) For Roads, all items of excavation and filling including treatment of sub base.

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 or in the schedule of rates 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 or the rate given in the said schedule of rates, as the case may be. 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, IWAI 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 utilized 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) IWAI 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 IWAI shall be bound to take over the materials or such portion thereof as the contractor does not desire to retain. For materials taken over or to be taken over by IWAI, 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 IWAI are rendered surplus, the same except normal wastage shall be returned by the contractor to IWAI 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 IWAI stores, if so required by IWAI, 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 IWAI 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 IWAI from the contractor under the terms of the contract.

CLAUSE 14 : 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

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 Authority, 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 IWAI 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 IWAI in completing the part work/ part incomplete work of any item(s) or the excess loss of damages suffered or may be suffered by IWAI as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to IWAI in law or per as agreement be recovered from any money due to the contractor on any account, and if such money is 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.

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 IWAI or where it affects whole of the works, as an abandonment of the works by IWAI, 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 IWAI, 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 IWAI for the loss suffered by him on account of delay by IWAI 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 IWAI.

CLAUSE 16 : Action in case 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 authorized subordinates in charge of the work and all the superior officers, officer of the Quality Assurance Unit of the IWAI 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 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 authorized subordinates in-charge of the work or In charge of Quality Assurance or his subordinate officers or the officers of the organization engaged by the IWAI for Quality Assurance or to the Chief Technical Examiner or his subordinate officers, that any work has been executed with unsound, imperfect, or unskilful 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 Lac 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.

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 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 twelve months (six months in the case of work costing Rs. Ten lacs 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 defect 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 proceeds of sale thereof or of a sufficient portion thereof. The security deposit of the contractor shall not be refunded before the expiry of twelve months (six months in the case of work costing Rs. Ten lacs 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 liabilities of the contractor under this contract, half of the security deposit will be refundable after six months and the remaining half after twelve months of the issue of the said certificate of completion or till the final bill has been prepared and passed whichever is later.

In case of Maintenance and Operation works 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, machinery, tools & plants as specified in schedule F. In addition to this, appliances, implements, other plants, ladders, cordage, tackle, scaffolding and temporary works required for the proper execution of the work, whether original, altered or substituted and whether included in the specifications 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 the measurement for 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 this contract or otherwise and/or from his security deposit or the proceeds of sale thereof, or of a sufficient portions thereof.

CLAUSE 18 A: Recovery of Compensation paid to Workmen

In every case in which by virtue of the provisions sub-section (1) of Section 12, of the Workmen's Compensation Act, 1923, Authority Government is obliged to pay compensation to a workman employed by the contractor, in execution of the works, Authority/Government will recover from the contractor, the amount of the compensation so paid; and, without prejudice to the rights of the Government under sub-section (2) of Section 12, of the said Act, Authority/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 IWAI to the contractor whether under this contract or otherwise. Authority shall not be bound to contest any claim made against it under sub-section (1) of Section 12, 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 Authority/Government might become liable in consequence of contesting such claim.

CLAUSE 18 B: Ensuring Payment and Amenities 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, Authority 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 19H or under the CPWD 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 IWAI Contractors, Authority 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 Authority/Government under sub-section(2) of Section 20, and sub-section (4) of Section 21, of the Contract Labour (Regulation and Abolition) Act, 1970, Authority/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 Authority shall not be bound to contest any claim made against it under sub-section (1) of Section 20, sub-section (4) of Section 21, 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 licence 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 provisions of the Child Labour (Prohibition and Regulation) Act, 1986.

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 fulfil 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 the age of fourteen years shall be employed on the work.

CLAUSE 19 B: Payment of Wages

Payment of wages:

- (i) The contractor shall pay to labour employed by him either directly or through subcontractors, wages not less than fair wages as defined in the IWAI 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 contract, the contractor shall comply with or cause to be complied with the Central Public Works Department contractor's 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 unauthorizedly 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 reason of non-fulfilment of the conditions of the contract for the benefit of the workers, non-payment of wages or of deductions made from his or their wages which are not justified by their terms of the contract or non-observance of the Regulations.
 - (b) Under the provision of Minimum Wages (Central) Rules, 1950, the contractor is bound to allow to the labours directly or indirectly employed in the works one day rest for 6 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 holidays to any labours and pay the same to the persons entitled thereto from any money due to the contractor by the Engineer-in-Charge concerned.

In the case of Union Territory of Delhi, however, as the all-inclusive minimum daily wages fixed under Notification of the Delhi Administration No.F.12(162)MWO/ DAB/43884-91, dated 31-12-1979 as amended from time to time are inclusive of wages for the weekly day of rest, the question of extra payment for weekly holiday would not arise.

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

- (vii) The laws 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

In respect of all labour directly or indirectly employed in the work for the performance of the contractor's part of this contract, the contractor shall at his own expense arrange for the safety provisions as per IWAI 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 arrangement 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 19 D

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 yours,
- (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 19F and the amount paid to them. Failing which the contractor shall be liable to pay to IWAI, a sum not exceeding Rs.200/- for each default or materially incorrect statement. The decision of the Divisional Officer 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

In respect of all labour directly or indirectly employed in the works for the performance of the contractor's part of this contract, 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 Central Public Works Department and its contractors.

CLAUSE 19 F

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 up to 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 total wages earned on the days when full time work was done during a period of three 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 three 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 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 Form as shown in appendix - I and II, and the same shall be kept at the place of work.

CLAUSE 19 G

In the event of the contractor(s) committing a default or breach of any of the provisions of the Central Public Works Department, 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, filing 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 per cent 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 IWAI Contractor's 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 within 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/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 hereinbefore 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 remodelled and/or reconstructed according to approved standards, 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 19 H

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.

- (i) (a) The minimum height of each hut at the eaves level shall be 2.10m (7 ft.) 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 1.80m x 1.50m (6’x5’) 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.
- (i) (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 gobi on both sides. The floor may be kutchra but plastered with mud gobi 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 7.2m (8 yards) between the rows of huts which may be reduced to 6m (20 ft.) according to the availability of site with the approval of the Engineer-in-Charge. Back to back construction will be allowed.
- (ii) **Water Supply** - The contractor(s) shall provide adequate supply of water for the use of labourers. The provisions shall not be less than two gallons of pure and wholesome water per head per day for drinking purposes and three gallons 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 river, tanks which may be of metal or masonry, shall be provided. The contractor(s) shall also at his/ their own cost make arrangements for laying pipelines for water supply to his/ their labour camp from the existing mains wherever available, and shall pay all fees and charges therefore.
 - (iii) The site selected for the camp shall be high ground, removed from jungle.
 - (iv) **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 eight seats in case of dry system.
 - (v) **Drainage** - The contractor(s) shall provide efficient arrangements for draining away sullage water so as to keep the camp neat and tidy.
 - (vi) The contractor(s) shall make necessary arrangements for keeping the camp area sufficiently lighted to avoid accidents to the workers.
 - (vii) **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 19 I

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. In respect of maintenance/repair or renovation works etc. where the labour have an easy access to the individual houses, the contractor shall issue identity cards to the labourers, whether temporary or permanent and he shall be responsible for any untoward action on the part of such labour. AE/JE will display a list of contractors working in the colony/Blocks on the notice board in the colony and also at the service centre, to apprise the residents about the same.

CLAUSE 19J

It shall be the responsibility of the contractor to see that the building under construction is not occupied by anybody unauthorizedly during construction, and is handed 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 shall 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 the delay in completion and for such delay, a levy upto 5% of tendered value of work may be imposed by the Superintending Engineer whose decision shall be final both with regard to the justification and quantum and be binding on the contractor.

However, the Superintending 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 Government Training Institute/Industrial Training Institute/National Institute of construction Management and Research (NICMAR)/National Academy of Construction, CIDC or 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 along with 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 complied with

The contractor shall comply with all the provisions of the Minimum Wages Act, 1948, and Contract Labour (Regulation and Abolition) Act, 1970, amended from time to time 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 sublet. Action in case of insolvency

The contract shall not be assigned or sublet without the written approval of the Engineer-in-Charge. And if the contractor shall assign or sublet his contract, or attempt to do so, or become insolvent or

commence any 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 Chairperson, IWAI shall have power to adopt the course 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 :

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 IWAI/Government without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.

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 :

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

(A) 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 Chairperson in writing for written instruction or decision. Thereupon, the Chairperson shall give his written instructions or decision within a period of one month from the receipt of the contractor's letter. Chairperson 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 Chairperson shall give his decision within 30 days of receipt of contractor's appeal.

25.1 Except where otherwise provided in the contract, all questions and disputes or difference where decision has not been final and conclusive arising between Contractor and the Authority relating to the meaning of the specifications, design, 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 referred for arbitration in the manner provided as under and to the sole arbitrator appointed as follows

- (i) Either of the parties may give to the other notices in writing of the existence of such question dispute or difference.
 - (ii) Within thirty (30) days of receipt of such notice from either party the engineer-in-charge of work at the time of such dispute shall send to the Contractor panel of three persons and there after the Contractor within fifteen (15) days of receipt of such panel communicate to the Engineer-in-charge the name of one of the persons from such panel and such a person shall then be appointed as sole arbitrator by the Chairman, IWAI. However, the arbitration so appointed shall not be an officer or the employee of Inland Waterways Authority of India.
 - (iii) Provided that if the Contractor fails to communicate the selection of a name out of the panel so forwarded to him by the Engineer-in-charge then after the expiry of the aforesaid stipulated period the Chairman, shall without delay select one person from the aforesaid panel and appoint him as the sole arbitrator.
- 25.2 The arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason, then the Chief Engineer shall appoint another person to act as sole arbitrator, such person shall be entitled to proceed with the reference from the stage at which it was left by the predecessor.
- 25.3 The award of the Arbitrator shall be final and binding. The Arbitrator shall decide in what proportion the Arbitrator's fees, as well as the cost of Arbitration proceeding shall be borne by either party.
- 25.4 The Arbitrator with the consent of the parties can enlarge the time, from, time-to-time to make and publish his award.
- 25.5 A notice of the existence in question, dispute or difference in connection with the contract unless served by either party within 30 days of the expiry of the defects liability period, failing which all rights and claim under this contract shall be deemed to have been waived and thus forfeited and absolutely barred.
- 25.6 The Arbitrator shall give reasons for the award if the amount of claim in dispute is Rs. 75,000/- and above.
- 25.7 The work under this Contract shall continue during Arbitration proceedings and no payments due from or payment by the Authority shall be withheld on account of such proceedings except to the extent which may be in dispute.

25.8 The Arbitration and Conciliation Act 1996 with any statutory modifications or re-enactment thereof and the rules made there under and being in force shall apply to the Arbitration proceedings under this clause.

NOTE: In case of contract with another Public Sector Undertaking, following Arbitration Clause shall apply: "Except as otherwise provided, in case of a contract with a public Sector Undertaking if at any time any question dispute or difference whatsoever arises between the parties upon or in relation to, or in connection with this agreement, the same shall be settled in terms of the Ministry of Industry, Department of Public Enterprises O.M.No.3/5/93-PMA dated 30.06.93 or any modifications / amendments thereof. "The arbitrator shall have the power to enlarge the term to rate the award with the consent of the parties provided always that the commencement or continuation of the arbitration proceeding shall not result in cessation or suspension of any of other rights and obligations of the parties of any payments due to them hereunder.

25.9 The parties to the agreement hereby undertake to have recourse only to arbitration proceedings under for Arbitration Act 1996 and the venue of the arbitration proceeding shall be Noida/ New Delhi and the parties will not have recourse to Civil Court to settle any of their disputes arising out of this agreement except through arbitration.

25.10 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 Chief Engineer of the appeal.

25.11 It is also a term of this contract that no person, other than a person appointed by Chairperson, IWAI 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.

25.12 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.

CLAUSE 26 : Contractor to indemnify IWAI/Govt. against Patent Rights

The contractor shall fully indemnify and keep indemnified the Chairperson, IWAI 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 IWAI 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 Chairperson, IWAI 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 includes lump sum 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 specifications as referred to in Clause 11, such work shall be carried out in accordance with the Bureau of Indian Standards Specifications. In case there are no such specifications in Bureau of Indian Standards, the work shall be carried out as per manufacturers' 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 : Withholding and lien in respect of sum due from contractor -Not Applicable

CLAUSE 29 : Lien in respect of claims in other Contracts -Not Applicable

CLAUSE 30 :Employment of coal mining or controlled area laobur not permissible -Not Applicable

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.

CLAUSE 31 A : Departmental water supply, if available - Not Applicable

CLAUSE 32 :Alternate water arrangements -Not Applicable

CLAUSE 33 : Return of Surplus materials -Not Applicable

CLAUSE 34 : Hire of Plant & Machinery -Not Applicable

CLAUSE 35 : Condition relating to use of asphaltic materials - Not Applicable

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 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.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

- (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 substitutes.

CLAUSE 37 : 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 Authority/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.

If pursuant to or under any law, notification or order any royalty, cess or the like becomes payable by the Government of India 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 Government of India 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 (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 Superintending engineer (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 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.

CLAUSE 39 : Termination of Contract on death of contractor

Without prejudice to any of the rights or remedies under this contract, if the contractor dies, the Engineer in charge on behalf of the Chairperson, IWAI shall have the option of terminating the contract without compensation to the contractor.

CLAUSE 40 : If relative working in CPWD then the contractor not allowed to tender-Not Applicable

CLAUSE 41: No Gazetted Engineer to work as contractor within one year of retirement

No engineer of gazetted rank or other gazetted officer employed in engineering or administrative duties in an engineering department of the Government of India 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 Government of India 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 Government of India as aforesaid, before submission of the tender or engagement in the contractor's service, as the case may be.

CLAUSE 42 : Return of material & recovery for excess material used

- (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 for use in the work shall be calculated on the basis and method given hereunder:-
 - (a) Quantity of cement & bitumen shall be calculated on the basis of quantity of cement & bitumen required for different items of work as shown in the Schedule of Rates mentioned in Schedule 'F'. In case any item is executed for which standard constants for the consumption of cement or bitumen are not available in the above mentioned schedule/statement or cannot be derived from the same shall be calculated on the basis of standard formula to be laid down by the Engineer-in-Charge.

- (b) Theoretical quantity of steel reinforcement or structural steel sections shall be taken as the quantity required as per design or as authorized by Engineer-in-Charge, including authorized lappages, chairs etc. plus 3% wastage due to cutting into pieces, such theoretical quantity being determined and compared with the actual issues each diameter wise, section wise and category wise separately.
 - (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 authorized 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 as per the Annexure of the standard schedule of rates and recovery at rates specified in Schedule 'F', shall be final & binding on the contractor. For non-scheduled items, the decision of the Superintending Engineer 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 IWAI 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 warlike 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 warlike operation, the contractor shall when ordered (in writing) by the Engineer-in-Charge to 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 material and for reconstruction of all works ordered by the Engineer-in-Charge, such payments being in addition to compensation upto 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 chief Engineer . The contractor shall be paid for the damages/destruction suffered and for restoring the material at the rate based on

analysis of rates tendered for in accordance with the provision 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 warlike 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 material etc. not on the site of the work or for any tools, plant, machinery, scaffolding, temporary building 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 chief Engineer.

CLAUSE 44 : Apprentices Act provision to be complied with -Not Applicable

CLAUSE 45 :

Release of Security Deposit of the work shall not be refunded till the contractor produces a clearance deposit after labour certificate from the Labour Officer. As soon as the work is virtually complete the contractor clearance shall apply for the clearance certificate to the Labour Officer under intimation to the Engineer-in-Charge. The Engineer-in-Charge, on receipt of the said communication, shall write to the Labour Officer to intimate if any complaint is pending against the contractor in respect of the work. If no complaint is pending, on record till after 3 months after completion of the work and/or no communication is received from the Labour Officer to this effect till six months after the date of completion, it will be deemed to have received the clearance certificate and the Security Deposit will be released if otherwise due.

NOTE: In case of difference or ambiguity in Hindi and English version, the English version will prevail.

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 hand-hold shall be provided on the ladder and the ladder shall be given an inclination not steeper than $\frac{1}{4}$ to $1\frac{1}{4}$ horizontal and 1 vertical.)
2. Scaffolding of staging more than 3.6 m (12ft.) above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached or bolted, braced and otherwise secured at least 90 cm. (3ft.) high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends there of 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 platforms, 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 (12ft.) above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (2) 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 person or materials by providing suitable fencing or railing whose minimum height shall be 90 cm. (3ft.)
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 9m. (30ft.) in length while the width between side rails in rung ladder shall in no case be less than 29 cm. (11½") for ladder upto and including 3 m. (10 ft.) in length. For longer ladders, this width should be increased at least $\frac{1}{4}$ " for each additional 30 cm. (1 foot) of length. Uniform step spacing of 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 defence of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit; action or proceedings to any such person or which may, with the consent of the contractor, be paid to compensate any claim by any such person.
6. Excavation and Trenching - All trenches 1.2 m. (4ft.) or more in depth, shall at all times be supplied with at least one ladder for each 30 m. (100 ft.) in length or fraction thereof, Ladder shall extend from bottom of the trench to at least 90 cm. (3ft.) above the surface of the ground. The side of the trenches which are 1.5 m. (5ft.) or more in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5 m. (5ft.) 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 undercutting 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 equipment 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 welder's protective eye-shields.
 - iv) Stone breaker 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 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 measure are adhered to :-
 - a) Entry to workers into the line shall not be allowed except under supervision of the representative of the Engineer-in-charge or any other higher officer.

- 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 off 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 blowers are recommended for ventilating the manholes. The Motors for these 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 Gumboots or non-sparking shoes bump helmets and gloves 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 lines.

- 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 rung fixed to manhole well.
 - 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 on 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 precaution should be taken:-
- a) No paint containing lead or lead products shall be used except in the form of paste or ready-made paint.
 - b) 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 is dry rubbed and scrapped.
 - c) 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 the cessation of work.
9. An additional clause (viii)(i) of Safety Code (iv) 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 pastes or 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.
 - iii) Measures shall be taken, wherever practicable, to prevent danger arising out of from dust caused by dry rubbing down and scraping.
 - iv) Adequate facilities shall be provided to enable working painters to wash during and on cessation of work.

- v) Overall shall be worn by working painters during the whole of working period.
 - vi) Suitable arrangement shall be made to prevent clothing put off during working hours being spoiled by painting materials.
 - vii) Cases of lead poisoning and suspected lead poisoning shall be notified and shall be subsequently verified by medical man appointed by competent authority of I.W.A.I.
 - viii) I.W.A.I. may require, when necessary medical examination of workers.
 - ix) Instructions 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 materials and adequate.
(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 condition 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.
12. Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards. 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 energized, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The worker should not wear any rings, watches and carry keys or other materials which are 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.
16. Notwithstanding the above clauses from (1) to (15), 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.

Models Rules for the Protection of Health and Sanitary Arrangements for Workers Employed by Contractors

1. APPLICATION

These rules shall apply to all buildings and construction works 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.

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

- (i) 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.
- (ii) The first-aid box shall be distinctly marked with a red cross on white back ground and shall contain
 - a) For work places in which the number of contract labour employed does not exceed 50. Each first-aid box shall contain the following:-
 - 1. 6 small sterilized dressings.
 - 2. 3 medium size sterilized dressings.
 - 3. 3 large size sterilized dressings.
 - 4. 3 large sterilized burn dressings.
 - 5. 1 (30 ml.) bottle containing a two per cent alcoholic solution of iodine.
 - 6. 1 (30 ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.
 - 7. 1 snakebite lancet.
 - 8. 1 (30 gms.) bottle of potassium permanganate crystals.
 - 9. 1 pair scissors.
 - 10. 1 copy of the first-aid leaflet issued by the Director General, Factory Advice Service and Labour Institutes, Government of India.
 - 11. 1 bottle containing 100 tablets (each of 5 gms.) of aspirin.
 - 12. Ointment for burns.
 - 13. A bottle of suitable surgical antiseptic solution.
 - b) For work places in which the number of contract labour exceed 50. Each first-aid box shall contain the following:
 - 1. 12 small sterilized dressings.
 - 2. 6 medium size sterilized dressings.
 - 3. 6 large size sterilized dressings.

4. 6 large size sterilized burn dressings.
5. 6 (15 gms.) packets sterilized cotton wool.
6. 1 (60 ml.) bottle containing a two per cent alcoholic solution iodine.
7. 1 (60 ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.
8. 1 roll of adhesive plaster.
9. 1 snake bite lancet.
10. 1 (30 gms.) bottle of potassium permanganate crystals.
11. 1 pair scissors.
12. 1 copy of the first-aid leaflet issued by the Director General Factory Advice Service and Labour Institutes /Government of India.
13. A bottle containing 100 tablets (each of 5 gms.) of aspirin.
14. Ointment for burns.
15. A bottle of suitable surgical antiseptic solution.

- (iii) Adequate arrangements shall be made for immediate recouplement of the equipment when necessary.
- (iv) Nothing except the prescribed contents shall be kept in the First-aid box.
- (v) 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.
- (vi) A person in charge of the First-aid box shall be a person trained in First-aid treatment in the work places where the number of contract labour employed is 150 or more.
- (vii) 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.
- (viii) 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 person 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 waterproof.

- (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 female 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 upto 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 fastenings.
- (iii) Construction of latrines: The inside walls shall be constructed of masonry or some suitable heat-resisting nonabsorbent materials and shall be cement washed inside and outside at least once a year, Latrines shall not be of a standard lower than borehole system.
- (iv)
 - (a) Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers "For Men only" or "For Women Only" as the case may be.
 - (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 upto 50 and one for female workers upto fifty 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 upto the first 500 and one for every 100 or part 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 sewage system shall comply with the requirements of the Public Health Authorities.
- (vii) Water shall be provided by means of 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 of 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 to 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 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 (10 ft.) 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. (6 sft) per head.

Provided that the Engineer-in-Charge may permit subject to his satisfaction, a portion of the building under construction or other alternative accommodation to be used for the purpose.

8. CRECHES

- (i) At every work place, at which 20 or more women worker 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 bedroom. The rooms shall be constructed with specifications as per clause 19H (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 room and sufficient number of cots and beddings in the bed room.
- (iv) The contractor shall provide one ayaa to look after the children in the creche when the number of women workers does not exceed 50 and two when the number of women workers exceed 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 where in 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, storeroom, 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 materials 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 arrangements shall be made for the collection and disposal of garbage.
- (ix) The dining hall shall accommodate at a time 30 per cent of the contract 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 (10 sqft) per diner to be accommodated as prescribed in sub-Rule 9.

- (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, chair or benches shall be available for the number of diners to be accommodated as prescribed in sub-Rule 9.
- (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.
- 2. The furniture utensils and other equipment 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.
- 2. A service counter, if provided, shall have top of smooth and impervious material.
- 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 foodstuffs, and other article served in the canteen, the following items shall not be taken into consideration as expenditure namely:-
 - (a) The rent of land and building.
 - (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 of 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. The above rules shall be incorporated in the contracts and in notices inviting tenders and shall form an integral part of the contracts.

12. AMENDMENTS

Authority/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.

Contractor's Labour Regulations

1. These Regulation are based on CPWD Contractor's Labour Regulations and are as following. All appendix referred herein shall be as per format given in CPWD form 6 with necessary modifications required by IWAI:

2. DEFINITIONS

i) Workman means any person employed by contractor directly or indirectly through a subcontractor with or without the knowledge of the IWAI to do any skilled, semiskilled 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 exercises 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, person to whom any article or materials are given out by or on behalf of the principal employers to be made up cleaned, washed, altered, ornamental finished, repaired adopted or otherwise processed for sale for the purpose of the trade or business of the principal employers 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.

No person below the age of 14 years shall be employed to act as a workman.

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 subcontractor.

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.
- 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.
- 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 overtime 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 Minimum Wages Act, the actual wages being paid, the hours of work for which such wage are earned, wages periods, dates of payments 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 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 payment 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 authorized 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 acknowledgment.
- x) It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the Junior Engineer or any other authorized 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 Junior Engineer or any other authorized 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 Nohas 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 deduction 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 overpayment 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 accident - 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 the Hospital.
 - i) Period of treatment and result of treatment.

- j) Percentage of loss of earning capacity and disability as assessed by Medical Officer.
 - 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) 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) 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) The contractor shall maintain a Register of Advances in Form XXIII of the CL (R&A) Rules 1971 (Appendix-XIII)
- (viii) 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 (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 & 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 authorized by the Ministry of Urban Development in this behalf.

12. POWER OF LABOUR OFFICER TO MAKE INVESTIGATIONS OR ENQUIRY

The Labour Officer or any person authorized by Central Government on their behalf shall have power to make enquires with a view to ascertaining and enforcing due and proper observance of Fair Wage Clauses and the Provisions of these Regulations. He shall investigate into any complaint regarding the default made by the contractor or subcontractor in regard to such provision.

13. REPORT OF LABOUR OFFICER

The Labour Officer or other persons authorized as aforesaid shall submit a report of result of his investigation or enquiry to the Chief Engineer 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 Chief Engineer.

- (i) The Chief Engineer shall arrange payments to the labour concerned within 45 days from the receipt of the report from the Labour Officer.

14. APPEAL AGAINST THE DECISION OF LABOUR OFFICER

Any person aggrieved by the decision and recommendations of the Labour Officer or other person so authorized may appeal against such decision to the Engineer in Charge within 30 days from the date of decision, forwarding simultaneously a copy of his appeal to the Chief Engineer but subject to such appeal, the decision of the officer shall be final and binding upon the contractor.

15. PROHIBITION REGARDING REPRESENTATION THROUGH LAWYER

- 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 employers 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, authorized by the Central Government on his behalf.

17. SUBMISSIONS 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 chief Engineer concerned shall be final.

REGISTER OF MATERNITY BENEFITS (Clause 19 F)

Name and address of the contractor.....

Name and location of the work

Name of the employee	Father's/husband's name	Nature of employment	Period of actual employment	Date of which notice of confinement given
1	2	3	4	5

Date on which maternity leave commenced and ended

Date of delivery/miscarriage	In case of delivery		In case of miscarriage	
	Commenced	Ended	Commenced	Ended
6	7	8	9	10

Leave pay paid to the employee

In case of delivery		In case of miscarriage		Remarks
Rate of leave pay	Amount paid	Rate of leave pay	Amount paid	
11	12	13	14	15

**SPECIMEN FORM OF THE REGISTER, REGARDING MATERNITY BENEFIT
ADMISSIBLE TO THE CONTRACTOR'S LABOUR**

Name and address of the contractor.....

Name and location of the work

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 discharged/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 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.
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.

Labour Board

Name of work

Name of Contractor.....

Address of Contractor.....

Name and address of IWAI office.....

Name of Labour Officer.....

Address of Labour Officer.....

Name of Labour Enforcement Officer.....

Address of Labour Enforcement Officer

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

**Form-XVII (See Rule 78(2)(a))
Register of Wages**

Name and address of contractor.....
 Name and address of establishment under which contract is carried on.....
 Nature and location of work.....
 Name and address of Principal Employer.....
 Wages Period: Monthly/Fortnight

Sl. No.	Name of workman	Serial No. in the register of workman	Designation/nature of work done	No. of days worked	Units of work done	Daily rate of wages/piece rate	Amount of wages earned					Deductions if any (indicate nature)	Net amount paid	Signature of thumb impression of the workman	Initial of contractor or his representative
							Basic wages	Dearness allowance	Overtime	Other cash payments (indicate nature)	Total				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Form-XIX
[See rule 78 (2) (b)]
Wages Slip

Name and Address of contractor

Name and Father's/husband's 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. Deduction, if any.....
7. Net amount of wages paid

Initials of the contractor or his representative

**Form-XIV
[See rule 76]
Employment Card**

- Name and Address of contractor
- Name and address of establishment 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 employed
 3. Nature of employment/designation
 4. Wage rate (with particulars of unit in case of piece work)
 5. Wage period
 6. Tenure of employment
 7. Remarks

Signature of contractor

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 both in 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 IWAI.
3. Taking or giving bribes or any illegal gratifications.
4. Habitual late attendance.
5. Drunkenness lighting, riotous or disorderly or indifferent behavior.
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 IWAI 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 of manufacturing or making of unauthorised particles 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 authorised by the employer.
20. Holding meeting inside the premises without previous sanction of the employers.
21. Threatening or intimidating any workman or employer during the working hours within the premises.

Notice for appointment of Arbitrator[Refer Clause 25]

To
The Chairperson
Inland Waterways Authority of India
A-13, Sector-1
Noida

Dear Sir/Madam,

In terms of clause 25 of the agreement, particulars of which are given below, I/we hereby give notice to you to appoint an arbitrator for settlement of disputes mentioned below:

1. Name of applicant
2. Whether applicant is Individual/Prop. Firm/Partnership Firm/Ltd. Co.
3. Full address of the applicant
4. Name of the work and contract number in which arbitration sought
5. Name of the Division which entered into contract
6. Contract amount in the work
7. Date of contract
8. Date of contract Date of initiation of work
9. Stipulated date of completion of work
10. Actual date of completion of work (if completed)
11. Total number of claims made
12. Total amount claimed
13. Date of intimation of final bill (if work is completed)
14. Date of payment of final bill (if work is completed)
15. Amount of final bill (if work is completed)

Specimen signatures of the applicant
(Only the person/authority who signed the contract should sign)

I/We certify that the information given above is true to the best of my/our knowledge. I/We enclose following documents.

1. Statement of claims with amount of claims.
- 2.
- 3.
- 4.

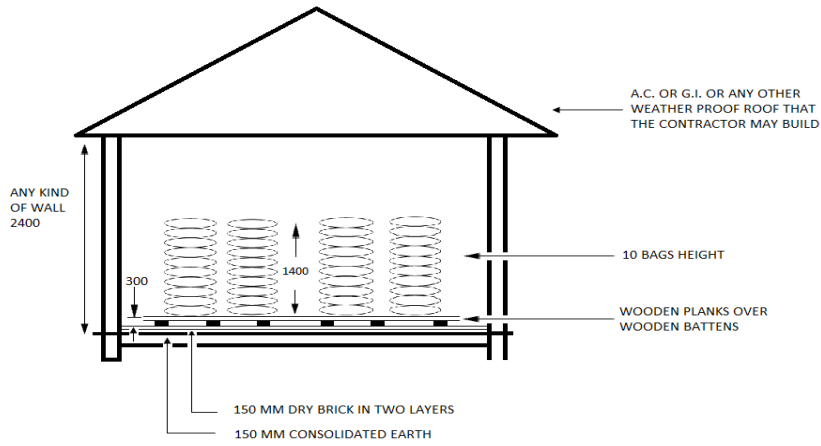
Yours faithfully,

(Signatures)

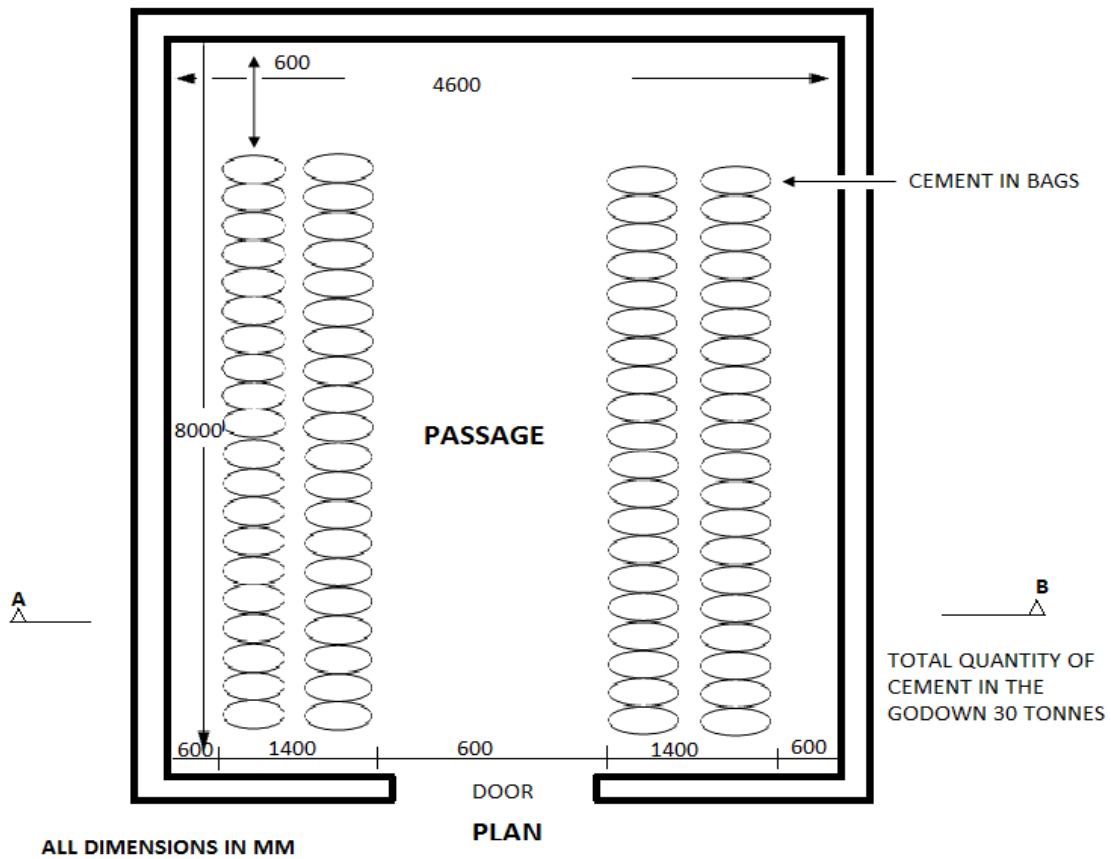
Copy in duplicate to:

1. The Chief Engineer,
IWAI, Noida

SKETCH OF CEMENT GODOWN



SECTION AB





SPECIAL CONDITION

1. The work in general shall be executed as per the description of the items, special conditions, provisions of this tender document and the CPWD Specifications 2009 Vol-I&II with correction slip as referred in the tender document supplemented with the specifications.
2. The order of preference in case of any discrepancy may be read as the following:
 - a) Nomenclature of item as per Schedule of Quantities
 - b) Particular specifications, Additional Specifications, special conditions .
 - c) General conditions.
 - d) Additional conditions
 - e) General Contract Conditions
 - f) CPWD Specifications for civil and electrical as applicable.
 - g) Architectural/structural drawings and specifications mentioned in drawings.
 - h) Indian Standard Specifications of BIS
 - i) Sound engineering practice as per directions of the Engineer-in-Charge.
 - j) Manufacturers specifications.

A reference made to any Indian Standard Specifications in these documents, shall imply reference to the latest version of that Standard, including such revisions/ amendments as issued by the Bureau of Indian Standards upto last date of receipt of tenders. The contractor shall keep at his own cost all such publications of relevant Indian Standards applicable to the work at site.

3. The contractor(s) shall give to the Municipality, police and other authorities all necessary notices etc. that may be required by law and obtain all requisite licenses for temporary obstructions, enclosures etc. and pay all fee, taxes and charges which may be leviable on account of these operations in executing the contract. He shall make good any damage to the adjoining property whether public or private and shall supply and maintain lights either for illumination or for cautioning the public at night.
4. The Contractor(s) shall take all precautions to avoid accidents by exhibiting necessary caution boards day and night, speed limit boards, red flags, red lights and providing barriers. He shall be responsible for all damages and accidents caused to existing/new work due to negligence on his part. No hindrances shall be caused to traffic during the execution of the work. In case of any accident of labours / contractor(s) staff the entire responsibility will rest on the part of the contractor and any compensation under such circumstances if becomes payable the same shall be entirely born by the contractor and IWAI shall have no role on this account.

5. The Contractor(s) shall take instructions from the Engineer-in-Charge regarding collection and stacking of materials at place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, services and compound walls are to be constructed. The stacking shall take place as per stacking plan however, if any change is required, the same shall be done with the approval of Engineer-in-Charge.
6. Contractor(s) shall provide permanent bench marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of the work. All such reference points shall be in relation to the levels and locations, given in the Architectural and plumbing drawings. On completion of work, the Contractor(s) shall submit at his own cost four prints of as built drawings to the Engineer-in-Charge. These drawings shall have the following information.
 - a) Run off all piping and their diameters including soil waste pipes and vertical stacks.
 - b) Ground and invert levels of all drainage pipes together with locations of all manholes and connections, upto outfall.
 - c) Run off all water supply line with diameters, locations of control valves, access panels etc.
7. Water tanks, taps, sanitary, water supply and drainage pipes, fittings and accessories should conform to bye-laws of municipal body/corporation, where CPWD specifications are not available. The Contractor (s) should engage approved, licensed plumbers for the work and get the materials (fixtures/fittings) tested, by the municipal Body/Corporation authorities wherever required at his own cost. The Contractor(s) shall submit for the approval of the Engineer-in-Charge, the name of the plumbing Agency proposed to be engaged by him.
8. The contractor shall give performance test of the entire installation(s) as per the specifications in the presence of the Engineer-in-charge or his authorized representative before the work is finally accepted and nothing extra what-so-ever shall be payable to the contractor for the test.
9. Any cement slurry added over base surface (or) for continuation of concerting for better bond is deemed to have been built in the items and nothing extra be payable (or) extra cement considered in consumption on this account.
10. **WATER PROOFING TREATMENT OF ALL TYPES OF WORK:** The Contractor(s) shall submit for the approval of the Engineer-in-Charge, the names of specialized agencies, of repute along with their technical capability proposed to be engaged by him.
11. Other agencies will also simultaneously execute and install the works of internal electrification, fire-fighting etc. of this work and the contractor shall afford necessary facilities for the same. The contractor shall leave such recesses, holes, opening etc. as may be required for the electric and other related works and nothing extra shall be payable on this account.

12. The IWAI shall not bear responsibility for lack of such knowledge and also the consequences thereof. The information and site data shown in the drawings and mentioned herein and also elsewhere in the tender documents are being furnished for general information and guidance only. The Engineer-in-charge in no case shall be held responsible for the accuracy thereof or any interpretation / or conclusions drawn there from by the contractor.
13. The contractor shall conduct his work, so as not to interfere with or hinder the progress or completion of the work being performed by other contractor(s) or by the Engineer-in-Charge and shall as far as possible arrange his work and shall place and dispose off the materials being used or removed, so as not to interfere with the operations of other contractor simultaneously working or he shall arrange his work with that of the others in an acceptable and coordinated manner and shall perform it in proper sequence to the complete satisfaction of others.
14. The work shall be carried out in accordance with the Architectural drawings and structural drawings, to be issued from time to time, by the Engineer-in-Charge. Before commencement of any item of work, the contractor shall correlate all the relevant architectural and structural drawings issued for the work and satisfy himself that the information available there from is complete and unambiguous. The discrepancy, if any, shall be brought to notice of Engineer-in-Charge before execution of the work. The contractor alone shall be responsible for any loss or damage occurring by the commencement of work on the basis of any erroneous and or incomplete information.
15. The contractor shall leave such recesses, holes, openings etc. as may be required for the electric, air-conditioning and other related works (for which inserts, sleeves, brackets, conduits, base plates, clamps etc. shall be supplied free of cost by the department unless otherwise specifically mentioned) and the contractor shall fix the same at the time of casting of concrete, stone work & brick work, if required, and nothing extra shall be payable on this account.
16. No payment shall be made for any damage caused by rain, snowfall, flood or any other natural calamity, whatsoever during the execution of the work. The contractor shall be fully responsible for any damage to the property and work for which the payment has been advanced to him under the contract and he shall make good the same at his risk and cost.
17. The works in general shall be supervised by the Engineers of IWAI. However, outside Consultant(s) may be appointed for quality assurance, field inspection/ measurements, structural design and monitoring, if so considered necessary and expedient by the Department.
18. The work shall be carried out strictly in conformity with the issued drawings and in accordance with the nomenclature of the items, attached specifications etc. Any discrepancy in the drawing /nomenclature of item /additional specification etc shall be got clarified from Engineer in Charge. Decision of Engineer in Charge shall be final and binding on the agency.

19. PROGRAMME CHART

- i) The Contractor shall prepare an integrated programme chart in MS Project software for the execution of work, showing clearly all activities from the start of work to completion, with details of manpower, equipment and machinery required for the fulfillment of the programme within the stipulated period or earlier and submit the same for approval to the Engineer-in-Charge within ten days of award of the contract. **A recovery of Rs. 5000/ shall be made on per day basis in case of delay** in submission the above programme subject to a max. of **Rs 1,00,000/-**.
 - ii) The programme chart should include the following:
 - a) Descriptive note explaining sequence of the various activities.
 - b) Network (PERT / CPM / BAR CHART).
 - c) Programme for procurement of materials by the contractor.
 - d) Programme of procurement of machinery / equipments having adequate capacity, commensurate with the quantum of work to be done within the stipulated period, by the contractor. In addition to above to achieve the progress of work as per programme, the contractor must bring at site at least 1000 sqm of shuttering material required for cement concrete and R.C.C. works etc. till the completion of RCC work as per requirement of work. The construction agency shall submit shuttering schedule adequate to complete structure work within laid down physical milestones etc.
 - iii) If at any time, it appears to the Engineer-in-Charge that the actual progress of work does not conform to the approved programme referred above, the contractor shall produce a revised programme showing the modifications to the approved programme to ensure completion of the work. The modified schedule of programme shall be approved by the Engineer in Charge.
 - iv) The submission for approval by the Engineer-in-Charge of such programme or the furnishing of such particulars shall not relieve the contractor of any of the duties or responsibilities under the contract. This is without prejudice to the right of Engineer-in-Charge to take action against the contractor as per terms and conditions of the contract.
 - v) Contractor shall give the Engineer-in-charge **on 5th day** of each month a progress report in MS Project with base line programme referred above for the work done during previous month failing which a recovery @ **Rs. 5,000/- per day of the delay** shall be effected.
20. If the work is carried out in more than one shift or during night, no claim on this account shall be entertained. The contractor has to take permission from the police authorities etc. if required for work during night hours, no claim / hindrance on this account shall be considered if work is not allowed during night time.
21. Existing drains, pipes, cables, over-head wires, sewer lines, water lines and similar services encountered in the course of the execution of work shall be protected against the

damage by the contractor at his own expense. In case the same are to be removed and diverted. The same shall be payable to the contractor. The contractor shall work out the cost and the same shall be approved by Engineer-in-Charge. The contractor shall not store materials or otherwise occupy any part of the site in a manner likely to hinder the operation of such services.

22. The Contractor shall be responsible for the watch and ward / guard of the buildings safety, fittings and fixtures provided by him against pilferage and breakage during the period of installations and thereafter till the building is physically handed over to the department. No extra payment shall be made on this account.

SAMPLE OF MATERIALS

23. Sample of building materials, fittings and other articles required for execution of work shall be got approved from the Engineer-in-Charge before use in the work. The quality of samples brought by the contractor shall be judged by standards laid down in the relevant BIS specifications. All materials and articles brought by the contractor to the site for use shall conform to the samples approved by the Engineer-in-Charge which shall be preserved till the completion of the work.
- 24.. BIS marked materials except otherwise specified shall be subjected to quality test at the discretion of the Engineer-in-Charge besides testing of other materials as per the specifications described for the item/material. Wherever BIS marked materials are brought to the site of work, the contractor shall, if required, by the Engineer-in-Charge, furnish manufacturer's test certificate or test certificate from approved testing laboratory to establish that the material / procured by the contractor for incorporation in the work satisfies the provisions of specifications / BIS codes relevant to the material and / or the work done.
25. The contractor shall be fully responsible for the safe custody of materials brought by him / issued to him even though the materials may be under double lock and key system.
- 26.. The contractor shall procure the required materials in advance so that there is sufficient time to testing of the materials and clearance of the same before use in the work. 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 work. The sealed samples are to be handed over to the testing lab by contractor in the presence of representative of Engineer-in-charge.
27. The rate of items of flooring is inclusive of providing sunken flooring in bathrooms, kitchen if any etc. and nothing extra on this account is admissible.
28. Malba, rubbish & other waste materials shall be reused at site as directed by Engineer in Charge or disposed off to recycling agents.
29. Work is to be carried out in a restricted area and in running office building. It shall be deemed that the contractor has satisfied himself as to the nature and location of the

work, general and local conditions and particularly those pertaining to transport, including the restrictions on plying trucks etc. The IWAI may provide all assistance by way of reasonable recommendations, in obtaining permits for plying trucks etc. from the concerned traffic authorities but bears no responsibility for the same. It shall be assumed that the contractor has also satisfied himself about, handling, availability and storage of materials, availability of labour, weather conditions at site and general ground level and the contractor has estimated and calculated his cost accordingly.

30. The tenderer shall study carefully, the building drawings, specifications, schedule of quantities and conditions of the tender documents to fully appreciate the scope of work before quoting his rates.
31. The building work shall be carried out in the manner complying in all respects with the requirements of relevant bye-laws of the local body under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-Charge and nothing extra shall be paid on this account.
32. The contractor shall ensure the stability of the excavation so that the surrounding ground and all adjoining structures and plants will be safe against settlement, subsidence, and damage and that there is no risk of injury to personnel.
33. Before start of work, the Contractor keeping in view that the space available is limited shall furnish a construction yard layout, specifying areas for constructions, positioning of machinery, material yard, cement and other storage, steel fabrication yard, site laboratory, water tank etc. and seek formal approval of the Engineer-in-Charge. The contractor shall not stack building material/melba on the NOIDA land or road or on the land owned by any other authority, as the case may be. In case, the Contractor is found stacking the building material/malba as stated above, he shall be liable to pay the stacking charges as may be levied by NOIDA or any other local body or authority and also to face penal action as per the rules, regulations and bye-laws of the said body or authority. The Engineer-in-Charge shall be at liberty to recover the sums due but not paid to the concerned authorities on the above counts from any sums due to the contractor including amount of the Security Deposit or Retention Money in respect of this contract or any other contract.
34. The contractor shall give a trial run of the equipments and machinery for establishing its capability to achieve the specifications within laid down tolerances to the satisfaction of the Engineer-in-charge before commencement of work.
- 35.. The contractor shall be responsible for arranging at his own cost all necessary tools and plants required for proper execution of work.
36. All tools, plant and machinery provided by the contractor shall, when brought on to the site, be deemed to be exclusively intended for the construction and completion of this work and the contractor shall not remove the same or any part thereof (save for the purpose of moving it from one part of the site to another) without the consent of the Engineer-in-Charge.

37. No foreign exchange shall be made available by the department for the purchase of equipment's, plants, machinery, materials of any kind or any other items required to be carried out in execution of work.
38. The contractor should maintain the registers for cement, paint, water proofing compound and other materials as required by the Engineer-in-charge and these should be signed by the contractor or his authorised representative and the representative of the Engineer-in-charge.
39. The contractor shall make his own arrangements for temporary electric connection, if required and make necessary payment including electric charges for its use direct to the electricity department concerned. The IWAI will not at all be responsible for making arrangements in these regards. The IWAI will provide all possible assistance by way of reasonable recommendation for obtaining electric connection to the concerned authorities but bears no responsibility for the same.
40. The contractor has to make his own arrangement for housing, stores and field offices, accommodation for his labour and other employees etc. The arrangements of water for drinking purposes shall also be made by the contractor at his own cost.
41. The rates for various items of the work shall apply for all floor heights and depths unless otherwise specified in the relevant items or schedule of quantity attached with this tender document.
- 42.. All incidental charges of any kind whatsoever including cartage, storage, cutting and wastage etc., shall be borne exclusively by the contractor and nothing extra shall be paid to him on this account.
43. The contractor shall provide at his own cost suitable weighing measures, levelling equipments and measuring equipments etc. at site for checking the weight, dimensions and levels as may be necessary for execution of work.
44. The work of water supply, internal / external sanitary installations and drainage etc. shall be carried out as per bye-laws of the local body and the contractor shall produce necessary completion certificate wherever required from such authority after completion of work.
45. The contractor shall provide and maintain CGI Sheet barricading (if required) not less than 8'-0" in height from ground level duly painted in white and green as required according to the rules of local body authorities in NOIDA or any other relevant authority for the works by the side of road.
46. The contractor shall arrange carrying out of all tests required under the agreement through the laboratory as approved by the Engineer-in-Charge and shall bear all charges in connection therewith including fee for testing. The cost of tests shall be borne by the contractor/department in the manner indicated below.

- i) By the contractor, if the results show that the cement and steel does not conform to relevant BIS code.
 - ii) By the department, if the results show that the cement and steel conforms to relevant BIS codes.
Contractor shall establish a laboratory at site of work at his own cost. The laboratory shall be equipped, inter alia, with the following equipments :
- a) **Balances:**
 - i) 7 kg to 10 kg capacity, semi-self-indicating type – Accuracy 10 gm.
 - ii) 500 gm capacity, semi-self-indicating type Accuracy 1 gm.
 - iii) Pan Balance- 5 kg Capacity- Accuracy 10 gm.
 - iv) Weighing platform of capacity 100 kg
 - b) **Ovens-** Electrically operated, thermostatically controlled upto 110⁰C- Sensitivity 1⁰C.
 - c) **Sieves : as per IS: 460**
 - i) IS Sieves – 450 mm internal dia of sizes 100 mm, 80 mm, 63 mm, 50 mm, 40 mm, 25 mm , 20 mm, 12.5 mm, 10 mm, 6.3 mm, 4.75 mm, complete with lid and pan.
 - ii) IS Sieves – 200 mm internal dia (brass frame) consisting of 2.36 mm, 1.18 mm, 500 microns, 425 microns, 300 microns, 212 microns, 150 microns, 90 microns, 75 microns with lid and pan.
 - d) Sieve shaker capable of 200 mm and 300 mm dia sieves, manually operated with timing switch assembly.
 - e) Equipment for slump test- slump cone, steel plate, taping rod, steel scale, scoop.
 - f) Equipment for concrete testing
 - i) Concrete cube moulds 15x15x15cm.--20 Nos.
 - ii) Pruning Rods 2Kg weight length 40cm and ramming face 25 mm 4 Nos.
 - iii) Extra Bottom plates for 15cm cube mould 3 Nos.
 - iv) Standard Vibration table for cubes 1 No
 - v) Dial gauges 25 mm travel- 0.01 mm/division Least count- 2 Nos.
 - g) 100 tonnes compression testing machine, electrical –cum- manually operated.
 - h) Graduated measuring cylinders (,100ml, 200ml, 250ml, 500ml, - 2Nos/each), . Beaker capacity 500ml, 200ml, 50ml-2Nos /Each, wash bottles capacity 50ml- 2Nos Each, thermometres 0-100 degree centigrade – 5Nos each.
 - i) Enamel trays (for efflorescence test for bricks)
300 mm x 250 mm x 40 mm – 2 Nos.
 - j) Other instruments like set of box spanner ratchet-2Nos., hacksaw with 6blades -

1Nos.,measuring tape 2mtr. 2Nos., Depth Gauge 20cm 2Nos.,Steel tapes- 3 m, vernier Calipers, micrometer Screw 25 mm gauge, a good quality plumb bob, spirit level minimum 30 cm long with 3 bubbles for horizontal vertical, wire gauge (Circular type) disc, foot rule, long nylon thread, rebound hammer for testing concrete, dynamic penetrometer, magnifying glass , screw driver 30 cms. Long ball pein hammer 100 gms, plastic bags for taking samples, moisture meter for timber, etc.

49. The day to day receipt and issue accounts of different grade/ brand of cement shall be maintained separately in the standard proforma by the representative of Engineer in charge and which shall be duly signed by the contractor or his authorized representative.



OTHER CONDITIONS

1. The bidder shall acquaint himself with the site of work, its approach roads, working space available for stacking of material, equipment, labour hutments, etc. before quoting. Since the building is occupied by IWAI, access to vehicles, officials and visitors to office building will be permitted from one side including access to basement and necessary barricading to provide safety of building and visitors shall be done by the contractor at his cost.
2. The contractor shall take all necessary precautions to prevent any nuisance or inconvenience to the owners, tenants or occupiers of adjacent properties and to the public in general and to prevent any damage to such properties and any pollution of smoke, streams and water-ways. He shall make good at his cost and to the satisfaction of the Engineer-in-Charge, any damage to roads, paths, cross drainage works or public or private property whatsoever caused thereon by the contractor. All waste or superfluous materials shall be carried away by the contractor without any reservation entirely to the satisfaction of the Engineer-in-Charge.
3. Utmost care shall be taken to keep the noise level to the barest minimum so that no disturbance as far as possible is caused to the occupants / users of building.
4. The contractor shall ensure that their material, workman do not obstruct/damage the window and curtain walls, glass panes, façade of building, office furniture, materials, racks and other goods, fixtures, etc and maintain a peaceful atmosphere and any damage to the building, glass panes, curtain wall or any fitting and fixtures of the existing building shall be made good by the contractor at his cost. The entire work shall be done at contractor's risk. Any damage to the property or injury to any of the staff, visitors and labour of the other contractors shall be at the contractor's risk. The contractor shall take necessary insurance cover for all their workmen working at the site.
5. The contractor shall cover external surface of existing as well as newly constructed building /part of building with suitable curtain/cover to make site protected from any damage, disturbance to office staff etc.

4. Setting Out

- 4.1 The contractor shall establish, maintain and assume responsibility for grades, lines, levels and bench marks. He shall report any errors or inconsistencies regarding grades, lines, levels, dimensions to the Engineer-in-Charge before commencing work. Commencement of work shall be regarded as the contractor's acceptance of such grades, lines, levels and dimensions and no claim shall be entertained at a later date for any errors found.
5. If at any time, any error in this respect shall appear during the progress of the work, the contractor shall, at his own expense rectify such error if so required to the satisfaction of the Engineer-in-Charge.

- 5.1 Though the site levels may be indicated in the drawings the contractor shall ascertain himself and confirm the site levels with respect to bench mark from the concerned authorities.
- 5.2 The approval by the Engineer-in-Charge of the setting out by the contractor shall not relieve the contractor of any of his responsibilities.
- 5.3 The contractor shall be entirely and exclusively responsible for the horizontal, vertical and other alignment, level and correctness of every part of the work and shall rectify effectively any errors or imperfections therein. Such rectifications shall be carried out by the contractor at his own cost to the instructions and satisfaction of the Engineer-in-Charge.
6. The rates quoted by the contractor are deemed to be inclusive of site clearance, setting out work, profile, establishment of reference bench mark, spot levels, construction of all safety and protection devices, barriers, earth embankments, preparatory works, all testing of materials working during monsoon, working at all depths, height and locations etc. unless specified in the schedule of quantities.
7. The proposed building work is a prestigious project and quality of work is of paramount importance. Contractor shall have to engage well experienced skilled labour and deploy modern T&P and other equipments to execute the work.
8. No payment shall be made for any damage caused by rain, snowfall, flood or any other natural calamity, whatsoever during the execution of the work. The contractor shall be fully responsible for any damage to the govt. property and work for which the payment has been advanced to him under the contract and he shall make good the same at his risk and cost. The contractor shall be fully responsible for safety and security of his material, T&P, Machinery brought to the site by him.
9. **STORAGE AND ISSUE OF MATERIALS :**
 - 9.1 Steel reinforcement shall be stored in such a way as to avoid distortions and to prevent deterioration by corrosion.
 - 9.2 The contractor shall construct suitable godowns as per specifications of work for storing the materials safe against damage due to sun, rain dampness, fire, theft etc. He shall also employ necessary watch and ward establishment for the purpose.
 - 9.3 The days to day receipt and issue accounts of different grade/brand of cement shall be maintained separately in the standard proforma by the representative of Engineer in charge and which shall be duly signed by the contractor or his authorized representative.
10. **SAMPLES OF MATERIALS :**
 - 10.1 Samples of all building materials, fittings and other articles required for execution of the work shall be got approved from the Engineer-in-Charge. Articles manufactured by Firms of

repute and approved by the Engineer-in-Charge shall only be used. Articles classified as "First Quality" by the manufacturer shall be used unless otherwise specified. Preference shall be given to those articles which bear BIS Certification mark. In case articles bearing BIS Certification mark are not available, the quality of samples brought by the contractor shall be judged by the standards laid down in the relevant BIS specifications. All materials and articles brought by the contractor to the site for use shall conform to the samples approved by Engineer -in-Charge which shall be preserved till the completion of the work.

- 10.2 The contractor shall be required to produce samples of all materials to be arranged and procured by him sufficiently in advance to obtain approval of the Engineer-in-charge. Subsequently the materials to be used in the actual execution of the work shall strictly of the same quality of samples approved. In case of variation in the quality, such materials shall be liable to rejection. The rejected material shall be immediately removed from the site of work by the contractor at his own cost. If the contractor fails to remove the rejected material from the site within 48 hours of their rejection, the Engineer-in-charge is authorised to remove the same at the risk and cost of the contractor. No claim financially or otherwise shall be entertained on account of any reason whatsoever.
- 10.3 The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material/ work beyond set out tolerance limits shall be summarily rejected by the Engineer-in-Charge.
- 10.4 Best make of approved quality of all fittings, fixtures, hinges, screws, nails etc. shall be used after getting the samples of same approved by the Engineer-in-charge

SECURITY & TRAFFIC ARRANGEMENTS:

- 11.1 Wherever the construction is taken up, the contractor shall provide at his own cost an all-weather motorable track/parking place if considered necessary by the Engineer-in-charge entirely to his satisfaction to facilitate the movement and parking of inspection vehicles.
- 11.2 No inflammable materials including P.O.L. shall generally be allowed to be stored at site. However, reasonable quantity may be permitted for storage subject to the compliance of all rules / instructions issued by the competent authorities and as per the direction of Engineer-in-Charge.
- 11.3 In the event of any restrictions (including temporary suspension of work) being imposed by the Security agency, NOIDA, Traffic or any other authority having jurisdiction in the area on the working or movement of labour /material, the contractor shall strictly follow such restrictions and nothing extra shall be payable to the contractor on this account. The loss of time on this account, if any, shall have to be made up by generating additional resources etc. General Security restrictions are given as under :
 - (i) The movement of trucks and vehicles shall be regulated in accordance with rules and regulations as approved by competent authority.

- (ii) The contractor shall inform, in advance, the truck registration numbers, ownerships of the trucks, names and addresses of the drivers for necessary action by the Security agency.
- (iii) Due to the site restriction, there is no possibility for labour huts to be erected at site. However, a few huts may be allowed as per the discretion of the Engineer-in-charge.
- (iv) Names and addresses of labourers/ staff etc. working at site shall be furnished for security verification.
- (v) The labourers / staff should not be changed too frequently once the verification of the character and antecedents is done.
- (vi) After verification of antecedents of workers, identification badges will be issued to them by the contractor under the seal of the Engineer-in-Charge or his representative. The cost of badges would be borne by the contractor.
- (vii) As and when there will be security requirements, certain additional restriction (s) can be imposed as per the requirement of the situation.
- (viii) No claim whatsoever will be entertained by the department on account of any restriction (including temporary suspension of work) imposed by the security agencies in execution of work.

11.4 The contractor shall place a private security agency on the site of work to regulate movement of materials, personnels, vehicles and machinery. Nothing extra shall be paid on this account.

17. Minimum Quality Assurance Plan

17.1 Maintenance of Register of Tests

- (i) All the registers of tests carried out at construction site or in outside laboratories shall be maintained by the contractor which shall be issued to the contractor by Engineer-in-charge.
- (ii) All samples of materials including cement concrete cubes shall be taken jointly with contractor and representative of Engineer-in -charge. Cost of sample materials is to be borne by the contractor and he shall be responsible for safe custody of samples to be tested at site.
- (iii) All the test in field lab setup at construction site shall be carried out by the Engineer staff deployed by the contractor which shall be 100% witnessed by representative of Engineer-in -charge
- (iv) All the entries in the registers will be made by the designated Engineering Staff of the

contractor and same should be regularly reviewed by representative of Engineer-in -charge.

(v) Contractor shall be responsible for safe custody of all the test registers.

17.2 Submission of copy of all test registers, material at site register and hindrance register along with each alternate running account bill and final bill shall be mandatory.

17.3 Maintenance of Material at site (MAS) Register

- (i) All the MAS register including cement and steel registers shall be maintained by contractor which shall be issued to the contractor by Engineer-in-charge
- (ii) Each of the entry of receipt of material at site shall be 100% test checked by representative of Engineer-in -charge.
- (iii) Each MAS register shall be checked by representative of Engineer-in -charge .

17.4 It will be deemed that work so measured, checked and paid is of the required quality and standard, both in respect of ingredients as well as the intended functions it is supposed to perform. In other words, the work would not only meet the required specifications but also the workmanship as per sound engineering practices.



ANNEXURE FOR GUARANTEE BONDS

ANNEXURE-I

GUARANTEE TO BE EXECUTED BY CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF WATER PROOFING WORKS

The agreement made this.....day of year two thousand andbetween M/s (Hereinafter called the Guarantor of the one part) and the CHAIRPERSON, IWAI (Hereinafter called the owner of the other part).

WHEREAS THIS agreement is supplementary to a contract (Hereinafter called the contract) dated and made between the GUARANTOR OF THE ONE PART AND the owner of the other part, whereby the contractor inter-alia, undertook to render the building and structures in the said contract recited completely water and leak proof.

AND WHEREAS THE GURANTOR agreed to give guarantee to the affect that the said work will remain water and leak proof for ten years from the date of giving of water proofing treatment.

NOW THE GURANTOR hereby guarantee that water proofing treatment given by him will render the structures completely leak proof and the minimum life of such water proofing treatment shall be ten years to be reckoned from the date after the maintenance period prescribed in the contract.

Provided that the guarantor will not be responsible for leakage caused by earthquake or structural defects or misuse or alteration and for such purpose.

- a) Misuse of roof shall mean any operation which will damage proofing treatment, like chopping of firewood and things of the same nature which might cause damage to the proof.
- b) Alteration shall mean construction of an additional storey or a part of the roof or construction adjoining to existing roof whereby proofing treatment is removed in parts.
- c) The decision of the Engineer-in-Charge with regard to nature and cause of defects shall be final.

During this period of guarantee, the guarantor shall make good all defects and in case of any defect being found render the building water proof to the satisfaction of the Engineer-in-Charge at his cost and shall commence the work for such rectification within seven days from the date of issue of the notice from Engineer-in-Charge calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the Guarantors risk and cost. The decision of the Engineer-in-Charge as to the cost payable by the Guarantor shall be final and binding.

That if guarantor fails to execute the water proofing or commits breach thereunder; then the guarantor will indemnify the Principal and his successors against all loss, damage, cost any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/ or damage and/or cost incurred by the Authority/Government, the decision of the Engineer-in-Charge will be final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the obligator
..... andBy..... For and on behalf of the
CHAIRPERSON,IWAI on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of :

1. 2.

SIGNED FOR AND ON BEHALF OF THE CHAIRPERSON,IWAI

By in the presence of :

1. 2.

GUARANTEE TO BE EXECUTED BY CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF STONE WORK

The agreement made this.....day of year two thousand andbetween (Hereinafter called the Guarantor of the one part) and the CHAIRPERSON, IWAI (Hereinafter called the Owner of the other part).

WHEREAS THIS agreement is supplementary to a contract (Hereinafter called the contract) dated and made between the GUARANTOR OF THE ONE PART AND the owner of the other part, whereby the contractor inter-alia, undertook to render the work in the said contract structurally sound, of good work man-ship, finishing and use of sound materials.

AND WHEREAS THE GURANTOR agreed to give guarantee to the affect that the said work will remain structurally stable and guaranteed against faulty workmanship, finishing and materials.

NOW THE GURANTOR hereby guarantee that work executed by him will remain structurally stable after the expiry of maintenance period prescribed in the contract for the minimum life of the five years to be reckoned from the date after the expiry of maintenance period prescribed in the contract.

The decision of the Engineer-in-Charge with regard to nature and cause of defect shall be final.

During this period of guarantee, the guarantor shall make good all defects to the satisfaction of the Engineer-in-Charge calling upon him to rectify the defects failing which the work shall be got done by the IWAI by some other contractor at the Guarantors risk and cost. The decision of the Engineer-in-Charge as to the cost payable by the Guarantor shall be final and binding.

That if guarantor fails to make good all the defects, commits breach there under; then the guarantor will indemnify the Principal and his successors against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARNATOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and/or cost incurred by the IWAI, the decision of the Engineer-in-Charge will be final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the obligator andBy..... For and on behalf of the CHAIRPERSON, IWAI on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of :

1. 2.

SIGNED FOR AND ON BEHALF OF CHAIRPERSON, IWAI

By in the presence of :

1. 2.

GUARANTEE TO BE EXECUTED BY THE CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF WATER SUPPLY AND SANITARY INSTALLATIONS /CI /SCI PIPES ETC.

ITEM NOS.....

The agreement made this ____ Day of ____ Two thousand ..between M/s_____ (Hereinafter called the GUARANTOR of the one part) and the Chairperson, IWAI (hereinafter called the owner of the other part).

WHEREAS this agreement is supplementary to a contract (hereinafter called the contract) dated _____ and made between the GUARANTOR OF THE ONE PART AND the IWAI of the other part, whereby the contractor inter-alia, undertook to render the work in the said contract recited structurally stable workmanship, finishing and use of sound materials.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the affect that the said work will remain structurally stable and guaranteed against faulty workmanship, finishing, manufacturing defects of materials and leakages, etc.

NOW THE GUARANTOR hereby guarantee that the work executed by him will remain structurally stable after the expiry of maintenance period prescribed in the contract for the minimum life of two years to be reckoned from the date after the expiry of maintenance period prescribed in the contract.

The decision of the Engineer-in-charge with regard to nature and cause of defect shall be final.

During this period of guarantee, the guarantor shall make good all defects to the satisfaction of the Engineer-in-Charge calling upon him to rectify the defects failing which the work shall be got done by the IWAI by some other contractor at the Guarantor's cost and risk. The decision of the Engineer-in-Charge as to the cost payable by the guarantor shall be final and binding.

That if the guarantor fails to make good all the defects, commits breach thereunder, then the guarantor will indemnify the principal and his successor against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and/or cost incurred by the IWAI, the decision of the Engineer-In-Charge will be final and binding on both the parties.

IN WITNESS WHEREOF these presents have been executed by the obligator _____ and ____ by ____ for and on behalf of the CHAIRPERSON, IWAI on the day, month & year first above written.

Signed, sealed and delivered by OBLIGATOR in the presence of:

1. _____ 2. _____

SIGNED FOR AND ON BEHALF OF THE CHAIRPERSON, IWAI BY ____in the presence of:-

1. _____ 2. _____



TECHNICAL SPECIFICATION

(A) **Civil Work**

Work shall be carried out as per CPWD General Specifications 2009 (Reprint 2010) Part-1 and 2 corrected upto 30.09.2011 which is available as Government of India Publications.

1. **General:** The work in general shall be executed as per the description of items, special conditions, provision of tender document and CPWD Specifications with corrected up to date of submission of bids supplemented with the following specifications.
 - 1.1 The work shall be executed and measured as per metric dimensions given in the schedule of quantities, drawings etc. (FPS units wherever indicated are for guidance only)
 - 2 All stone aggregate and stone ballast shall be of hard stone variety to be obtained from approved quarries and or any other source to be got approved from the Engineer-in-Charge.
 3. The rates quoted by the contractor shall be inclusive of working in under water conditions and including pumping or bailing out water encountered from any source such as rains, floods, leakage from sewer and water mains, sub soil water table being high or for reasons of stability of structure or any other cause whatsoever. Nothing extra shall be payable on this account.
4. **Special Conditions for cement**
 - 4.1 Cement required for the work shall be procured by the contractor.
 - 4.2 The contractor shall procure 53 grade Pozolona Portland Cement (PPC) conforming to relevant IS code as required in the work from reputed manufacturers.
 - 4.3 The supply of cement shall be taken in 50kg. bags bearing manufacturer's name and ISI marking. The stacking of the cement bags shall be as per CPWD specifications 2009.
 - 4.4 Every delivery of cement shall be accompanied by producer's certificate confirming that the supplied cement conforms to relevant specifications. These certificates shall be endorsed to the Engineer in charge for his record.
 - 4.5 The cement shall be brought at site in bulk supply of approximately 20 tonnes or more as decided by the Engineer-in-charge.

- 4.6 The size of the cement godown is indicated in the sketch for guidance only. The actual size of godown shall be as per site requirements and as per the direction of the Engineer in charge and nothing extra shall be paid for the same. The decision of the Engineer-in-charge regarding the capacity required/needed will be final. However, the capacity of godown shall not be less than 20 tonnes. Godown shall be provided with a single door with two locks. The keys of one lock shall remain with Engineer-in-charge or his authorized person and that of other lock with the authorized representative of the contractor at the site of work so that the cement is issued from godown according to the daily requirement with the knowledge of both the parties. The account of daily receipt and issue of cement shall be maintained in a register in the prescribed Proforma and signed daily by the contractor or his authorized representative in token of its correctness.
- 4.7 Samples of cement arranged by the contractor shall be taken by the Engineer-in charge and got tested in accordance with provisions of relevant BIS codes. In case test results indicate that the cement arranged by the contractor does not conform to the relevant BIS codes, the same shall stand rejected and shall be removed from the site by the contractor at his own cost immediatly.
- 4.8 The contractor shall supply free of charge the cement required for testing. The cost of tests shall be borne by the contractor.
- 4.9 The actual issue and consumption of cement on work shall be regulated and proper accounts maintained as specified as above.
- 4.10 The theoretical, consumption of cement shall be worked out as per procedure prescribed in clause 42 of the contract and shall be governed by conditions laid therein. No payment for excess consumption of cement will be allowed. However, for consumption lesser beyond permissible theoretical variation recovery shall be made in accordance with conditions of contract at Schedule A to F without prejudice to action for acceptance of work/item at reduced rate or rejection as the case may be.
- 4.11 For non-schedule items, the decision of the chief Engineer regarding theoretical quantity of cement, which should have been actually used, shall be final and binding on the contractor.
- 4.12 Cement brought to site and remaining unused after completion of work shall not be removed from site without written permission of the Engineer-in-charge.
- 4.13 The damaged cement shall be removed from the site immediatly by the contractor on receipt of a notice in writing from the Engineer-in-charge. If he does not do so within 3 days of receipt of such notice, the Engineer-in-charge shall get it removed at the cost of the contractor.

5. CONDITIONS FOR STEEL REINFORCEMENT

- 5.1 The contractor shall procure TMT steel reinforcement bars confirming to Fe 500D of IS 1786 -2009 from the primary producers such as SAIL, TISCO or RINL as approved by Ministry of Steel.

- 5.2 In case of non-availability of steel from primary producers the Chief Engineer, IWAI may permit use of TMT reinforcement bars procured from secondary producers. In such cases following action shall be taken.
- a) The TMT bars shall conform to the specification of Fe- 500D grade of BIS 1786-2009
 - b) The secondary producers must have valid BIS license to produce HSD bars conforming to IS 1786: 2009. In addition to BIS license, the secondary producer must have valid license from either of the firms Tempcore, Thermex, Evcon Turbo & Turbo Quench to produce TMT Bars.
 - c) The TMT bars procured from secondary producers shall conform to the specifications as laid by Tempcore, Thermex, Evcon Turbo & Turbo Quench as the case may be.
 - d) The rate of providing & laying TMT reinforcement bars as quoted by the contractor in the tender shall be reduced by Rs. 5.00 + 15% =Rs.5.75 /- per kg, if the TMT reinforcement bars are procured by contractor from secondary producers
- 5.3 The contractor shall have to obtain and furnish test certificates to the Engineer-in-charge in respect of all supplies of steel brought by him to the site of work.
- 5.4 Samples shall also be taken and got tested by the Engineer-in-Charge as per the provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the contractor does not conform to the specifications, the same shall stand rejected, and it shall be removed from the site of work by the contractor at his cost work within a week time of written orders from the Engineer-in-charge to do so.
- 5.5 The steel reinforcement bars shall be brought to the site in bulk supply of 20 tonnes or more, or as decided by the Engineer-in-charge.
- 5.6 The steel reinforcement bars shall be stored by the Contractor at site of work in such a way as to prevent their distortion and corrosion, and nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.
- 5.7 For checking nominal mass, tensile strength, bend test, re-bend test etc. specimens of sufficient length shall be cut from each size of the bar at random, and at frequency not less than that specified below:

Size of bar	For consignment below 100 tonnes	For consignment above 100 tonnes
Under 10 mmdia bars	One sample for each 25 tonnes or part thereof	One sample for each 40 tonnes or part there of
10 mm to 16 mmdia bars	One sample for each 35 tonnes or part there of	One sample for each 45 tonnes or part there of
Over 16 mmdia bars	One sample for each 45 tonnes or part there of	One sample for each 50 tonnes or part there of

- 5.8 The contractor shall supply free of charge the steel required for testing including its transportation to testing laboratories. The cost of tests shall be borne by the contractor.
- 5.9 The actual issue and consumption of steel on work shall be regulated and proper accounts maintained. The theoretical consumption of steel shall be worked out as per procedure prescribed in clause 42 of contract and shall be governed by conditions laid therein. In case the consumption is less than the theoretical consumption including permissible variations recovery at the rate so prescribed shall be made. In case of excess consumption no adjustment need to be made.
- 5.10 The steel brought to site and the steel remaining unused shall not be removed from site without the written permission of the Engineer-in-charge.
- 5.11 (i) Reinforcement including authorized spacer bars and laps shall be measured in length of different diameters as actually (not more than as specified in the drawings) used in the work nearest to a centimeter. Wastage and unauthorized overlaps shall not be measured.
- (ii) The standard sectional weights referred to shall be as in CPWD specifications 2009 Vol. 1 will be considered for conversion of length of various sizes of TMT bars in to standard weight. Record of actual sectional weights shall also be kept dia wise and lot wise. The average sectional weight for each diameter shall be arrived at from samples from each lot of steel received at site. The decision of the Engineer in charge shall be final for the procedure to be followed for determining the average sectional weight of each lot. Quantity of each diameter of steel received at site of work each day will constitute one single lot for the purpose. The weight of steel by conversion of length of various sizes of bars based on the actual weighted average sectional weight shall be termed as Derived Actual Weight.
- (a) If the derived weight is less than the standard weight as in sub-para (ii) above, then the Derived Actual Weight shall be taken for payment.
- (b) If the derived actual weight is found more than the standard weight, then standard weight as worked out in sub para ii above shall be taken for payment and nothing shall be paid extra for the difference in Derived Actual Weight and standard weight.
- 5.11 Thermo-Mechanically Treated Bars (TMT) Bars conforming to specification of Fe 500D, IS-1786 shall be used in all RCC works.
- 5.12 Every care should be taken to avoid mixing different types of grades of bars in the same structural members as main reinforcement to satisfy relevant clause of IS: 456. In case of buildings, wherever the situation necessitates, the changeover shall be made only from any one level onwards. In case of foundations, all foundation elements (footings and grade beams) shall have the same kind of steel. In the case of columns, all structural

elements up to the level of change, where the changeover is taking place should have the same kind of steel as those in columns.

- 5.13 The reinforcing steel brought to site of work shall be stored on brick timber platform of 30/40-cm height, nothing extra shall be paid on this account.

6. Conditions for water:

- 6.1 The contractor shall make his own arrangement for providing water for construction and drinking purpose. Water charges shall not be recovered on account of it. Contractor shall get the water tested from any laboratory approved by the Engineer-in-charge at regular interval as per the CPWD specifications 2009 .All expenses towards collection of samples, packing transportation except testing charges, etc. shall be borne by the contractor.

7. Brick Work :

- 7.1 Unless otherwise specified, FPS bricks shall be used in all items for. The classifications of bricks brought by the contractor shall strictly conform to the CPWD specifications.

8. RCC WORK:

- 8.1 The cover blocks, wherever used, for proper cover & to avoid displacement of reinforcement bars shall be manufactured in factory noting extra shall be paid for providing such cover blocks in the work.
- 8.2 Nothing extra shall be paid for the centering & shuttering circular in shape wherever the form work is having a mean radius exceeding 6m in plan.
- 8.3 Rate quoted by the contractor for various items of reinforced cement concrete etc. shall be based on the cement content for the mixes specified in items of schedule of quantities, The contractor should take into the account the said Cement content for the mixes mentioned in items while quoting his rates. At the time of trial mixes to be designed by the contractor and approved by the Engineer-in-Charge, after the award of the work, if the cement content per cubic meter of concrete is different from the cement content as specified in items of schedule of quantities, the rates shall be adjusted on the basis of more/less use of cement as compared to the cement content per cubic meter mentioned in the item. The said adjustment in the rates shall be worked out as under.
In case the approved cement content (coefficient) in various grades of concrete mixes is less as compared to cement contents mentioned in the schedule of quantities, the less cement so used shall be adjusted at base rate of cement plus 1.0 percent towards water charges plus 15 % percent towards profit and overhead as per standard CPWD practices. The base rate cement for this purpose shall be taken as Rs. 5400/ per tonne at site. In case where approved cement content of various grades of concrete mixes is more as compared to cement content mentioned in the item of schedule of quantity, nothing shall be paid to the contractor.

9 Design Mix Concrete

9.1 Design mix concrete shall be used in the work for all structural members. For design mix IS Codes shall be followed (456-2000-Latest Edition)

Following parameters shall be adopted for mix design.

As per IS – 456-2000 (Latest Edition)

9.2 Approved admixtures conforming to IS 9103 shall be permitted to be used. The chloride content in the admixture shall satisfy the requirement of BS 5075. The total amount of chloride content in the admixture mixed concrete shall satisfy the requirement of IS 456-2000.

9.3 The concrete mix design without admixture will be carried out by the contractor, at his own cost, reputed laboratories/Test houses approved by the Engineer-in-Charge.

- i) IIT, Delhi
- ii) National Council for cement & Building Materials, Ballabgarh.
- iii) CRRI, Delhi
- iv) Delhi college of Engineering

9.4 In the event of all the four laboratories being unable to carry out the requisite design/testing, the contractor shall have to get the same done from any other reputed laboratory with prior approval of the Engineer-in-Charge.

9.5 The various ingredients for mix design/laboratory tests shall be sent to the approved lab/test houses through the Engineer-in-Charge and the samples of such ingredients sent shall be preserved at site by the department till completion of work or change in Design Mix whichever is earlier. The sample shall be taken from the approved materials which are proposed to be used in the work.

9.7 The contractor shall submit the mix design report from approved laboratory for approval of the Engineer-in-Charge within 30 days from the date of issue of letter of acceptance of the tender. No concreting shall be done until the mix design is approved by the Engineer-in-Charge.

The contractor shall make cubes of trial mixes as per approved mix design at site laboratory for all grades of concrete in presence of the Engineer-in-Charge using same ingredients as adopted for design mix, prior to commencement of concreting and get them tested in presence of the Engineer-in-Charge. The testing and the acceptance of the trial mixes shall be as per CPWD specifications. The conformity of mix design should be established by conducting three repeat trial mix tests. In each repeat trial mix test six cubes of standard size 15 cm x 15 cm x 15 cm shall be cast, out of which three cubes shall be tested after 7 days & 3 cubes shall be tested after 28 days as per CPWD specification 2009 Vol-I & Vol-II.

- 9.8 For each of change of source or quality/characteristic properties of the ingredients from that approved & used in the concrete mix during the work, a fresh mix design shall be got done by the contractor. Revised trial mix tests shall be conducted at laboratory established at site of the Engineer-in-Charge may order for testing of these cubes from the independent laboratory and shall be submitted by the contractor as per the direction of the Engineer-in-Charge.
- 9.9 The cost of packaging, sealing, transportation, loading, unloading, cost of samples and the testing charges for mix design in all cases shall be borne by the contractor.
- 9.10 The mix design shall be done considering the degree of quality control as good in all cases.

11. REQUIREMENT OF DESIGN MIX

- 11.1 The mix design for a specified grade of concrete shall be done for target mean compressive strength $T_{ck} = f_{ck} + 1.65 S$
 Where: f_{ck} = characteristic compressive strength at 28 days.
 S = Standard deviation which depends on degree of quality control.
- 11.2 The degree of quality control for this work shall be “good” for which the standard deviation (s) for different grades of concrete shall be as follows:

<u>Grade of Concrete</u>	<u>For Good quality of control</u>
M20	4.6
M25	5.3
M30	6.0
M35	6.7

However, standard deviation calculations of test result shall be done as per clause 9.2.4 of IS456-2000 for maintaining the quality control.

- 11.3 The mix design shall be carried out generally in accordance with the provisions made in CPWD specification and IS 456-2000 read along with the provisions mentioned in this document.

11.4 Acceptance criteria for trial mix:-

Average of all the cubes tested at 28 days shall be more than target mean strength (i.e. $f_{ck} + 1.65 S$).

No individual cube shall be less than 0.85 times the target mean strength.

11.5 Work Strength Test & Acceptance criteria:-

- (a) Work strength Test for strength of concrete shall be carried out as per CPWD specifications 90% of the total work strength tests shall be done at the laboratory established at site by the contractor and remaining 10% in the laboratory as directed by the Engineer-in-Charge. The acceptability criterion given in CPWD SPECIFICATIONS 2009 shall be read along with following:-

- (b) In case four consecutive tests results (as per CPWD specification) are not available in one day's concreting the standard deviation for purpose of acceptance of concrete shall be calculated on the basis of all the cube test results of that particular day of concreting.
- (c) If the cube results of individual cube do not comply with the condition mentioned in CPWD Specification 2009, but the test results satisfy the requirement of mean compressive strength as mentioned in CPWD Specification the concrete represented by the cube not meeting the requirements shall be at risk. The Engineer-in-Charge reserves the right to reject the said concrete or to accept it at reduced rates subject to establishing the structural adequacy by means of additional tests and suitable remedial measures as directed by Engineer-in-Charge.
- (d) If the test results do not satisfy the requirement of mean compressive strength as mentioned in CPWD specifications-2009 the concrete represented by the test result shall be at risk.

11.6 **Production of Concrete**

11.7 The preparation, mixing transportation, placing, compaction, testing of ingredients and admixtures etc. shall be as per the specifications.

12. **Ready Mix Concrete (RMC) from RMC producer**

12.1 The contractor shall be allowed to arrange Ready Mix Concrete (RMC) from the approved listed RMC producing plants as given in the approved list of materials. No batching mix plant shall be allowed at site.

12.2 The contractor shall, within a 15 days of award of the work, submit text of MO proposed to be entered between purchaser (the contractor) and supplier (RMC producer) to the Engineer-in-Charge for his approval. The contractor shall draw the MOU with approved RMC producer and submit to the Engineer-in-Charge within a week of such approval. The contractor will not be allowed to use ready mix concrete without completion of above stated formalities.

12.3 Notwithstanding the approval granted by the Engineer-in-Charge in aforesaid manner or provisions in CPWD specification 2009, the contractor shall be fully responsible for quality of concrete including input control, transportation and placement etc.

12.4 For all purposes the contractor shall carry out fully, the responsibilities of the placement contractor and the manufacturer of concrete.

12.5 The Engineer-in-Charge will reserve right to inspect at any stage and reject the concrete if he is not satisfied about quality of product at the user's end

- 12.6 The Engineer-in-Charge reserves the right to exercise control over the:-
- (i) Ingredients water and admixtures purchased stored and to be used in the concrete including conducting of tests for checking quality of materials recording of test result and declaring the materials fit or unfit for use it production of mix.
 - (ii) Calibration check of the RMC plant.
 - (iii) Weight and quantity check on the ingredients, water and admixture added for batch mixing.
 - (iv) Time of mixing of concrete.
 - (v) Testing of fresh concrete recordings of results and declaring the mix fit or unfit for use. This will include continuous control on the workability during production and taking corrective action, if required.
 - (vi) For exercising such control, the Engineer-in-Charge shall periodically depute his authorised representative at the RMC plant. It shall be responsibility of the contractor to ensure that all necessary equipment, manpower & facilities are made available to the Engineer-in-Charge and/or his authorized representative at RMC plant.
- 12.7 The contractor should therefore draw MOU/agreement with RMC producer very carefully keeping in view all terms and conditions/specifications forming part of this tender document.
- 12.8 All required relevant records of RMC shall be made available to the Engineer-in-Charge or his authorized representative. The Engineer-in-Charge shall as required, specify guidelines & additional procedures for quality control & other parameters in respect of materials, production & transportation of concrete mix which shall be binding on the contractor & the RMC plant. Only concrete as approved in design mix by the Engineer-in-Charge shall be produced in RMC Plant and transported to the site.
- 12.9 53 grade PPC (Conforming to IS-1489) of brand/make/source as approved by the Engineer-in-Charge shall only be used for production of concrete:

12.10 **Quality control of Ready Mixed concrete**

It shall be the responsibility of the contractor to ensure that RMC producer provides all necessary testing equipments and takes all necessary measures to ensure quality control of ready mixed concrete. In general the required measures shall be:-

I. Control of purchased material quality

RMC producer shall ensure that all the materials purchased and used in the production of concrete conform to the stipulation of the relevant agreed standards and the requirements of the concrete mix design and quality control procedures. This

shall be accomplished by visual checks, sampling and testing, certification from material supplier and information/date from materials supplier. Necessary equipment for the testing of all material shall be provided and maintained in calibrated condition at the plant by the RMC producer.

II. Control of material storage

Adequate and effective storage arrangement shall be provided by RMC producer at RMC plant for reliable transfer and feed systems, drainage of aggregate, prevention of freezing or excessive solar heating of aggregate, prevention of contamination etc.

III. Record of mix design and mix design modification

RMC producer shall ensure that record of mix design and mix design modification is readily available in his computer at RMC plant for inspection of Engineer-in-Charge or his authorized representative at any time. Any modification in mix design shall be done only after the approval of the Engineer-in-Charge.

IV. Transfer and weighing equipment

RMC producer shall ensure that a documented calibration procedure is in place. Proper calibration records shall be made available indicating date of next calibration due & corrective action taken. RMC producer shall ensure additional calibration checks whenever required by the Engineer-in-Charge in writing to contractor. RMC producer shall also maintain a daily production record including details of customers to whom RMC was supplied including details of mixes supplied. Record shall also be maintained of materials used for each day's production including water and admixtures.

The accuracy of measuring equipment shall be within $\pm 2\%$ of quantity of cement & $\pm 3\%$ of quantity of aggregate, admixture and water being measured.

V. Maintenance of Plant, Truck Mixers and Pumps:

Plant, Truck Mixers and Pumps should be well maintained so as to not hamper any operation of production, transportation and placement of concrete.

VI. Production of concrete at RMC producing plant

- i) Weighing (correct reading of batch date and accurate weighing): - For each load, written, printed or graphical records shall be made of the weights of the materials batched, the estimated slumps, the total amount of water added to the load, the delivery tickets number for that load and the time of loading the concrete into the truck.
- ii) Visual observation of concrete during production and delivery or during sampling and testing of fresh concrete (assessment of uniformity cohesion, workability, adjustment to water content):- The workability of the concrete shall be controlled on a

continuous basis during production. The batch mix found unfit shall not be loaded into the truck for transportation. Necessary corrective action shall be taken in the production of mix as required for further batches.

- iii) Adequate testing equipment at the plant including equipment for measuring surface moisture content of aggregates shall be provided by the RMC producer.
 - iv) Making corresponding adjustments at the plant automatically or manually to batched quantities to allow for observed measured or reported changes in materials or concrete qualities.
 - v) Sampling of concrete, testing, monitoring of results.
 - vi) Diagnosis and correction of faults identified from observations/complaints.
 - vii) Control of designed and the prescribed mixes: a quality control system shall be operated to control the strength of designed mixes to the required levels. The system shall include continuous analysis of results from cube tests.
- 12.11 Laying of RMC concrete – All Ready mixed Designed concrete shall be laid with the help of concrete pump of adequate capacity.

13. Use of Design mix Concrete

The contractor shall be allowed to arrange Ready MIX Concrete (RMC) producing plants (within 30-km distance from the site of work) supplying concrete in NOIDA. Ready mix concrete shall be arranged in quantity as required at site of work. The ready mix concrete shall be supplied as per the pre-agreed schedule approved by the Engineer-in-Charge. Nothing extra shall be payable on this account.

The item of design mix cement concrete (produced at site as well as arranged from RMC producer) shall be inclusive of all the ingredients including admixtures if required, labour, machinery, T&P transportation etc. (except shuttering which will be measured & paid for separately) required for a design mix concrete of required strength and workability. The rate quoted by the agency shall be net & nothing extra shall be payable on account of changes in quantities of concrete ingredients like cement and aggregates and admixtures etc. as per the approved mix design.

14. FORM WORK

- 14.1 The work shall be done in general as per CPWD Specifications.
- 14.2 Only M.S. centering / shuttering and scaffolding material unless & otherwise specified shall be used for all R.C.C. work to give an even finish of concrete surface. However, marine-ply shuttering in exceptional cases as per site requirement may be used on specific request from contractor to be approved by the Engineer- in-Charge for which no extra payment will be made.

- 14.3 Double steel scaffolding having two sets of vertical supports shall be provided for external wall finish, cladding etc. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding platform shall be fixed. Scaffolding shall have steel staircase for inspection of works at upper levels
- 14.4 Nothing extra shall be paid for the centering and shuttering, circular in shape whenever the form work is having a mean radius exceeding 6m in plan.
- 14.5 In order to keep the floor finish as per architectural drawings and to provide required thickness of the flooring as per specifications, the level of top surface of R.C.C. shall be accordingly adjusted at the time of its centering, shuttering and casting for which nothing extra shall be paid to the Contractor.
- 14.6 As per general engineering practice, level of floors in toilet / bath, balconies, shall be kept 12 to 20mm lower than general floors as required. Shuttering should be adjusted accordingly. Nothing extra is payable on this account. Steel shuttering as approved by the Engineer-in-Charge shall be used by the contractor. Minimum size of shuttering plates shall be 600mm x 900mm except for the case when closing pieces required to complete the shuttering panels. Dented, broken, cracked, twisted or rusted shuttering plates shall not be allowed to be used on the work. The shuttering plates shall be cleaned properly with electrically driven sanders to remove any cement slurry or cement mortar or rust. Proper shuttering oil or de-bonding compound shall be applied on the surface of the shuttering plates in the requisite quantity before assembly of steel reinforcement.
- The shuttering plates shall be cleaned properly with electrically driven sanders to remove any cement slurry or cement mortar or rust. Proper shuttering oil or de-bonding compound shall be applied on the surface of the shuttering plates in the requisite quantity before assembly of steel reinforcement.
- 14.7 For the execution of centering and shuttering, the contractor shall use propriety Reebole. Chemical mould release agent of FOSROC or equivalent as shuttering oil as approved by Engineer-in-charge and nothing extra shall be paid on this account.
- 14.8 Concreting of upper floor shall not be done until concrete of lower floor has set at least for 14 days but form work and reinforcement can be taken up after the concrete has set atleast for three days.

15. REINFORCEMENT

- 15.1 The reinforcement shall be done as per CPWD Specifications.
- 15.2 The rate of item of reinforcement of RCC work includes all operations including straightening, cutting, bending, welding, binding with annealed steel or welding and placing in position at all the floors with all leads and lift complete as per CPWD Specifications. The contractor shall provide approved type of support for maintaining

the bars in position and ensuring required spacing and correct cover of concrete to reinforcement as called for in the drawings, spacer blocks of required shape and size. Chairs and spacer bars shall be used in order to ensure accurate positioning of reinforcement. To ensure proper cover, only factory made round type cover blocks will be used to avoid displacement of bars in any direction.

16. WATER PROOFING:

- 16.1 The work in general shall be executed as per Manufacturers Specifications or CPWD Specifications as applicable.
- 16.2 Total quantity of the water proofing compound required shall be arranged only after obtaining the prior approval of the Engineer in Charge. Materials shall be kept under double lock and key and proper account of water proofing compound used in the work shall be maintained. It shall be ensured that the consumption of the compound is as per specified requirements.
- 16.3 The finished surface after water proofing treatment for floor in sunken portion shall have minimum slope of 1 in 48 unless otherwise decided by the Engineer in Charge.
- 16.4 Before commencement of treatment on floor surface, it shall be ensured the outlet drain/spouts have been fixed and the spout openings have been eased and rounded off properly for easy flow of water.
- 16.5 Contractor shall associate himself with anyone of the specialist firms relating to the water proofing treatment with the approval of Engineer in charge
- 16.6 The contractor shall ensure that the sunken, roof of the building shall be absolutely water tight and seepage/leak free. In case any seepage/leakage etc. is noticed the contractor shall make it water tight and seepage/leak proof at his own cost.
- 16.7 Construction Joints:

The contractor shall give his proposal for location and treatment of construction joints. The construction joints shall be provided only at places and in the manner as approved by Engineer in Charge.

Except where shown otherwise on the drawing, reinforcement shall continue through construction joints.

The foreign matter and laitance shall be cleaned properly by compressed air before starting further work.

17. GUARANTEE BOND FOR WATER PROOFING WORKS:

- 17.1 Ten years guarantee bond in prescribed proforma attached herewith shall be submitted by the contractor which shall also be signed by both the specialized agency and the

contractor to meet their liability/liabilities under the guarantee bond. However, the sole responsibility of above efficiency of water proofing treatment shall rest with the building contractor. Separate guarantee bonds shall be submitted by the contractor for different type of water proofing work. If any defect is noticed during the guarantee period, it shall be rectified by the contractor within seven days of receipt of intimation of defects pointed out are not attended within the specified period.

18. FLOORING

- 18.1 All the work in general shall be carried out as per CPWD Specifications 2009.
- 18.2 The tiles shall be as specified in the item. The tiles shall be of specified colours as shown in the drawings and will be laid in pattern as per architectural drawings. Nothing extra shall be paid for laying tiles in specific pattern. The tiles shall be of first quality of approved make.
- 18.3 Proper gradient shall be given to flooring for toilets, verandah, kitchen, courtyard etc. so that the wash water flows towards the direction of floor trap. Any reverse slop if found, these shall be made good by the contractor by ripping open the floor/grading concrete and nothing shall be paid for such rectifications.
- 18.4 The flooring and skirting will be executed as per pattern shown in the Architectural drawings and as per approval of Engineer-in-Charge and nothing extra shall be payable on this account.
- 18.5 Samples of flooring material are to be submitted well in advance to the Engineer-in-Charge for approval. Approved samples should be kept at site with the Engineer-in-Charge and the same shall not be removed except with the written permission of Engineer-in-Charge. No payment whatsoever will be made for these samples.
- 18.6 The rate shall include the cost of all materials and labour involved in all the operations. Nothing extra shall be paid for use of cut/sawn tiles in the work.

19. STONE FLOORING:

All work in general shall be carried out as per CPWD Specifications 2009.

- 19.1 Whenever flooring is to be done in patterns of stones, the contractor shall get samples of each pattern laid and approved by the Engineer-in-charge before final laying of such flooring. Nothing extra shall be payable on this account.
- i) The samples shall not be of a size less than 600mm x 600mm or as required by Engineer in Charge.
- ii) The sample produced shall be fully supported by the details of location/quarry and the same shall not be removed except with the written permission of Engineer-in-Charge.

- iii) Samples for Flame burnt/finish granite shall be produced separately. Flame burning shall be carried out after the selection of the basic granite sample.
 - iv) Flame burning shall be uniform and with a uniform texture across the entire surface of the stone slab.
 - v) The Flame burning of the stone slab shall be inspected by the Engineer in Charge as and when found necessary and full support for the inspection shall be provided.
 - vi) Full width stone over kitchen platform shall be provided except to adjust for closing pieces. The marble/any stone flooring in treads and risers of stair case is to be laid in single piece. Nothing extra shall be paid on these accounts.
- 19.2 The rate of items of flooring is inclusive of providing sunken flooring in bathrooms, kitchen etc. and nothing extra on this account is admissible. The proper gradient shall be given to flooring for toilets, verandah, kitchen, courtyard, etc. as per the directions of Engineer-in-charge.
- 19.3 The rate of item of marble/ Kota stone flooring is inclusive of providing patterns of required oblong shaped pattern with combination of both and nothing extra will be paid on this account.

20. WOOD WORK

- 20.1 The wood work in general shall be carried out as per CPWD Specifications 2009.
- i) Wood work shall not be painted, oiled or otherwise treated before it has been approved by the Engineer-in-Charge.
 - ii) All fittings and fixtures shall be got approved from the Engineer-in-Charge before procurement well in advance and the approved samples shall be kept at site till completion of the work.
- 20.2 Factory made wooden shutter, as specified shall be obtained from factories to be approved by the Engineer in Charge shall conform to relevant IS Code. The contractor shall inform well in advance to the Engineer in Charge the names and address of the factory where from the contractor intends to get the shutters manufactured. The contractor will place order for manufacturing of shutters only after written approval of the Engineer in Charge in this regard is given. The contractor is bound to abide by the decision of the Engineer in Charge and recommend a name of another factory from the approved list in case the factory already proposed by the contractor is not found competent to manufacture quality shutters. Shutters will however, be accepted only if this meet the specified tests. The contractor will also arrange stage wise inspection of the shutters at factory by the Engineer in Charge or his authorized representative. The contractor will have no claim if the shutters brought at site are rejected by the Engineer in Charge in part or in full lot due to bad workmanship/quality. Such shutters will not be measured and paid. The contractor shall remove the same from the

site of work within 7 days after the written instructions in this regard are issued by the Engineer in Charge.

- i) The shutters should be brought at site without primer / painting.
- ii) Inspection of shutters shall be carried out for dimensions & tolerances, size & type general construction & workmanship, finish & glazing at the following frequency: -

Lot Size	Sample Size	Permissible number of defectiveness
Upto 25	2	0
26 to 50	5	0
51 to 100	8	0
101 to 150	13	1
151 to 300	20	2
301 to 500	32	3
501 to 1000	50	5
1001 & above	80	7

- iii) Criteria for conformity

Any sample shutter failing in any one or more of the requirements inspected for as above shall be considered as defective. A lot shall be considered as having satisfied the requirements of the standard if the number of defective shutters in the sample does not exceed the corresponding permissible number of defectiveness given above.

- iv) Testing the shutters shall be tested for species seasoning & treatment, defects in the timber, panel material, construction & workmanship in the approved Govt. Laboratory at the frequency mentioned in CPWD specification: - If shutters are found defective in any one of the criterion double the shutter shall be tested & if found permissible can be accepted. If shutter is found defective in more than one criterion, the whole lot shall be rejected.
- v) Finish
 - a) All components of door shutter shall have smooth finish.
 - b) Panels of the door shutters shall be flat and well sanded to a smooth and level surface.
 - c) All the surfaces of door shutters which are required to be painted or polished or varnished shall be got approved from the Engineer In Charge before applying protective coat of primer, polish or varnish.

21. FINISHING

- 21.1 The work shall be carried out as per CPWD specifications.
- 21.2 The Primer, Synthetic Enamel paint, distemper etc. of makes as approved by the Engineer in charge and of low VOC (as specified in Additional Conditions), shall

only be used and brought to the site of, work in the original sealed containers. The material brought to the site of work shall be sufficient for the work. The material shall be kept under the joint custody of contractor and representative of the Engineer-in-Charge. The empty containers shall not be removed from the site till the completion of the work without permission of the Engineer-in-Charge.

22. PAINTING WORK:

- 22.1 The paint shall be of make, composition, texture and shade as per item of work and as approved by the Engineer-in-Charge and as per manufacture specifications.
- 22.2 The surface on which the paint is to be applied shall be smooth, regular and free from dust etc. Undulations, broken edges, minor imperfections and irregularities shall be rectified as specified by manufacturer and approved by Engineer-in-Charge so as to make the surface smooth and regular.
- 22.3 The paint shall be applied on the surface as per specifications.
- 22.4 During application, the surface should be well protected from strong winds, hot sun and cold weather. Adequate arrangement in this regard shall be made by the contractor.
- 22.5 Specifications in respect of scaffolding, protective measures, measurement and rate shall be as per CPWD Specifications 2009 Vol. I & II.

(B) ELECTRICAL

1. DSR Items work shall be carried out as per CPWD General Specifications for Electrical Works (Part-I- Internal) latest and CPWD General Specifications for Electrical Works (Part-II-External) latest as amended upto 30.09.2011.
2. General Specification For Electrical Work.
3. L. T. Panels (Power Control Centers & Switch Board Panels)
4. Moulded Case Circuit Breaker.
5. Metering, Instrumentation and Protection.
6. Medium Voltage Cables.
7. General Specification For Lightning Protection.
8. General Specification For: Fire Alarm System.

2.0 GENERAL SPECIFICATIONS FOR ELECTRICAL WORK:

1. SCOPE

In general, the contractor shall supply, store, erect, test and commission all the equipment required for Electrical Installation. The contractor shall furnish all the materials, labour, tools and equipments for the electrical work, as shown in the accompanying drawings and in the bill of quantities and specifications hereinafter described.

2. CONTRACTOR

The Contractor shall be a licensed electrical contractor, possessing a valid electrical contractor's license in the state, employing licensed supervisors and skilled workers having valid permits as per the Regulation of Indian Electricity Rules and Local Electrical Inspector's requirements. (In case the contractor does not have license of that state then it should be clearly stated through which local electrical contractor they shall submit the test report & a copy of the valid license of the contractor be enclosed along with the copy of their own license of the state of their registration).

3. DEFINITIONS

The following abbreviations used in the bill of quantities specifications and drawings represents:

ISS	-	Indian Standard specification.
IER	-	Indian Electricity Rules, 1956.
BS	-	British Standard (where specifically called for)
BSCP	-	British Standard Code of Practice (if called for).
HRC	-	High Rupturing Capacity
GI	-	Galvanised Iron
MS	-	Mild Steel

CI	-	Cast Iron
APLSTS	-	Aluminium conductor, paper insulated lead sheathed, Double steel tape armoured and serving.
PVC	-	Polyvinyl Chloride.
XLPE	-	Cross Linked Polyethylene.
HT	-	High Tension.
LT	-	Low Tension.
A-Amp	-	Ampere.
KV	-	Kilo Volts.
PT	-	Potential Transformers.
CT	-	Current Transformers.
OCB	-	Oil circuit Breakers
VCB	-	Vacuum Circuit Breaker
ACB	-	Air Circuit Breakers
SFU	-	Switch fuse Unit
COS	-	Change Over Switch
CFS	-	Combination Fuse Switch
MCCB	-	Moulded Case Circuit Breaker.
MCB	-	Miniature Circuit Breaker
IC	-	Iron Clad
ICTPN	-	Iron Clad Triple Pole and Neutral
ICDP	-	Iron Clad Double Pole
DB	-	Distribution Board
KVA	-	Kilo Volts Ampere.
KVAR	-	Kilo Volts Ampere - Reactive.
NC	-	Normally Close
NO	-	Normally open
SWG	-	Standard Wire Gauge.

4 REGULATION & STANDARDS

The installation shall conform in all respects to Indian standard Code of Practice for Electrical Wiring Installation I.S. - 732 and 'National Electrical Code'. It shall be in conformity with the current I.E Rules and Regulations and requirements of the local Electric Supply Authority in-so-far as these become applicable to the installation. Wherever this specification calls for a higher standard of materials and/or workmanship then those required by any of the above regulations, this specification shall take precedence over the said regulations and standards.

In general, the materials, equipments and workmanship not covered by the above, shall conform to the following Indian Standards (Latest Edition) unless otherwise called for:

(1) SWITCHGEAR

- a. Requirements of A.C. Circuit Breakers. : IS 2516 (Part I) Sec.1,2 & 3 (Part-II)
- b. Switches and Switch Isolators above 1000V But Not Exceeding 1.1 KV:IS 4710
- c. Markings & arrangements for switchgear bus-bars, main connection & auxiliary wiring:IS 375

- d. Specification for normal duty air break switches & composites unit for air break switches and fuses for voltage not exceeding 1000 Volts. : IS 4064
- e. Heavy duty air-break switches and composite units of air-break switches and fuses for voltages not exceeding 1000 Volts. : IS 4047
- f. Specification for miniature circuit breakers. : IS 8828
- g. Specification for enclosed distribution, fuse boards and cut-outs for voltage not exceeding 1000 Volts : IS 2675
- h. Installation and maintenance of switchgear. : IS 3072 (Part I)
- i. HRC cartridge fuse links 650 Volts. : IS 2208

(2) CABLE

- a. Specification for paper insulated and lead sheathed cables : IS 692
 - b. Code of Practice for installation and maintenance of paper insulated power cables (upto and including 33 KV) : IS 1255
 - c. Specification for PVC insulated (Heavy Duty) electric cables Part-I for Voltage upto 1100 Volts. : IS 1554
 - d. Specification for PVC insulated cables (for voltage upto 1100 V) (Part-II) with Aluminium conductors. : IS 694 (Part-II)
3. Specification for rigid steel conduit for electrical wiring. : IS 9537
 4. Specifications for rigid nonmetallic conduits for electrical installations: IS 9537
 5. Specifications for accessories for rigid steel conduits for Electrical wiring: IS 3837
 6. Box for the enclosure of electrical accessories steel and C.I. Boxes :IS 5133 (Part I)
 7. 3Pin plugs and sockets outlets : IS 1293
 8. Ceiling Roses : IS 371
 9. Adhesive insulating tapes for Electrical purposes (Part- I & II) : IS 2448
 10. General and safety requirements for Electrical lighting fittings. : IS 1913
 11. Watertight electric light fittings. : IS 3553
 12. Flood Lights. : IS 1947
 13. Ceiling fans and regulators. : IS 374
 14. Propeller type AG Ventilating fans : IS 2312
 15. Code of Practices for earthing. : IS 3043
 16. Glossary of terms for electrical cable and conductors. : IS 1885
 17. Code of Practice for buildings (General) Electrical installation : IS 1646
 18. Protection of buildings and allied structures against lighting. : IS 2309
 19. Current Transformers : IS 2705 (Part-I to III)
 20. Voltage Transformer : IS 3156 (Part-I to III)
 21. Power Transformer : IS 2026-1977 (Part-I to IV)
 22. Installation Transformer : IS 10029
 23. Shunt capacitors for Power system : IS 2834
 24. Direct acting electrical indicating instruments : IS 1246
 25. Factory assembled switchgear : IS 8623
 26. Rating for Cable : IS 3961 (Part -II)
 27. Earthing : IS 3843

5. INSPECTION & APPROVAL OF THE WORK BY LOCAL AUTHORITY

On completion of this work, the contractor shall obtain and deliver to the owners the certificates of inspection and approval by electrical inspectorate of local Local Administration. The fees paid for inspection will be reimbursed on production of challan/receipt. The contractor shall include in his rates all charges necessary for getting electrical installation approved which includes Sub-station, LT distribution, etc. by the Chief Electrical Inspector to the state government or/ and from any other authority required for this job.

INSPECTION OF MATERIALS

The Engineer-in-charge shall have access to the manufacturer's premises for inspection of any items of the tender for which contractor has made arrangement with manufacturer/suppliers. All such inspection shall not need any prior intimation by the Engineer in charge.

6. DRAWINGS

The drawings, specifications and bills of quantities shall be considered as a part of contract and any work or materials shown on the drawings and not called for in the specifications or vice-versa, shall be executed as if specifically called for in both. The contract drawings indicate the extent and general arrangement of various equipment and wiring, etc. and are essentially diagrammatic. The drawings indicate the point of termination of conduit runs and broadly suggest the routes to be followed. The work shall be executed as per approved working drawings, subject to any minor changes, if found essential to co-ordinate installation of this work with other trades. All such changes shall be without any additional major cost to the owners. The data given in the documents and drawings are approximate & their complete accuracy is not guaranteed. The drawings and data furnished are meant for guidance & assistance to the contractor. The exact dimension, location, distance and levels, etc., will be governed by the space conditions. The contractor shall examine all Architectural, structural, plumbing and sanitary and air-conditioning drawing before starting the work and report to the Engineer-in-charge any discrepancy which in his opinion appear on them, and get the same clarified. He shall not be entitled to any extras for omissions or defects in electrical drawings or when they conflict with other work.

7. WORKING DRAWINGS & SHOP DRAWINGS

The contractor shall prepare and submit to the Engineer-in-charge for approval detailed working drawings & shop drawings of all switch boards, L.T. Panel, H.T Panels, transformers, equipment, layout, cable layout, earthing, submission plans for electrical inspectorate, etc. within 60 days of award of work.

8. AS BUILT DRAWINGS

At the completion of the work and before issuance of certificate of virtual completion, the contractor shall submit to the Engineer-in-charge layout drawings drawn on tracing film and approved scale indicating the complete wiring as installed.

9. ENGINEER/ SUPERVISOR

The contractor shall employ a competent, licence, qualified full time electrical engineer / supervisor to direct the work of electrical installations in accordance with the drawings and

specifications. The engineer / supervisor shall be available at all times at times at the site to receive instructions from the Engineer-in-charge in any day to day activities throughout the duration of the contract. The engineer & supervisor shall correlate the progress of the work in conjunction with all the relevant requirements of the supply authority. The skilled workers employed for the work should have requisite qualifications and should possess competency certificate from the Electrical Inspectorate of Local Administration.

10. APPLICATION FOR ELECTRIC SUPPLY/ LIASON

The Contractor shall be responsible for filing and follow up application for electric supply to the project. The contractor shall carry out all the liaison work required for obtaining electric supply at site commencing from filing of application. This liaison shall be deemed to be a part of the contract.

3.0 L. T. PANELS (POWER CONTROL CENTERS & SWITCH BOARD PANELS)

1.1 GENERAL:

Medium voltage power control centres (generally termed as switch board panels) shall be in sheet steel clad cubicle pattern, free floor standing type, totally enclosed, compartmentalized design. This specification shall cover the following types of panels:

- a) Air circuit breaker panels - Drawout type with single or double tier arrangement as per design shown on the drawings.

Panels with one or more Air circuit breakers with Draw-out arrangement and switch-fuse units of non-drawout design.

Panels with switch- fuses of non- draw out type. However, the switch-fuse units can have drawout fuse-carriage if a particular make of switch-fuse is used.

The panels shall generally be of extensible type with provision for bus extension on or both sides as desired at the time of approved of shop drawings.

1.2 CODE/STANDARDS:

The panels shall generally conform to the requirements of following codes/ specifications:

- | | |
|-------------------|------------|
| a) IS-8623 | h) IS-2705 |
| b) IS-4237 | i) IS-722 |
| c) IS-2147 | j) IS-4064 |
| d) IS-3072 | k) IS-2208 |
| e) IS-375 | l) IS-6875 |
| f) IS-1248 & 2419 | m) IS-6005 |
| g) IS-5082 | |

The equipment shall conform to Indian Electricity Rules as amended upto-date.

The supplier shall examine the provision of these codes and confirm or indicate his comments.

1.3 CONSTRUCTION:

Power control centres/ switch board panels shall of free standing type, with sheet steel enclosure having following features:

- a) The panel shall be constructed of sheet steel of minimum 2.0 mm thickness. The internal frames shall be made of structural steel angles or made up sections (as per standard design of the manufacturer) specifications of which, shall be submitted along with offers.
- b) The panel shall be compartmentalised to accommodate one feeder in each compartment. The main bus bar chamber shall be provided at the top of panel or bottom of the panel as required. The compartments shall be arranged in section with metallic/ phenolic barrier in between.

A vertical cable alley of atleast 200mm width shall be provided to serve one/ two vertical section of feeders. Cable alley shall have hinged door/ doors with rubber gaskets. Suitable cable clamping arrangement with slotted steel members shall be provided in the cable alley. Similarly, vertical bus bar shall be housed in-between two feeder compartments in a separate bus chambers. The opening between bus chamber and feeder compartments shall be properly covered with Bakelite/ Hylam sheets of 3mm minimum thickness. The vertical bus chamber shall be provided with removable bolted covers on the front and back side. All the interconnecting links to the feeders shall be shrouded so as to avoid accidental contact, by means of phenolic barriers.

- c) Each compartment shall have its own hinged door with concealed hinges. The doors shall have heavy duty rubber gasket fixed on the inner side of the door. The door shall have interlocking facility with the feeder unit.
- d) The Panel shall have punched openings for mounting meters, lamps, push buttons, relays, etc.
- e) The dimensions of feeder compartments, bus chambers and cable alleys shall be as shown on the relevant drawings. However, the following minimum dimensions shall be strictly adhered to :

- i. ACB compartment Draw out - 600mm wide x 1000mm deep x 900mm high.

- ii. SWITCH FUSE UNITS/MOULDED CASE CIRCUIT BRACKER (NON-DRAWOUT TYPE):

Up to 63A/ 100A	:	300mm wide x 225mm high x 400mm deep
250A	:	400mm wide x 400mm high x 400mm deep
400A to 630A	:	400mm wide x 500mm high x 400mm wide.

(or vice- versa).

iii. **BUS CHAMBER:**

Main bus (Horizontal): 400mm high x 300mm deep
Vertical bus (Feeder bus) : 300mm wide x 400mm deep

iv. Cable alley : Min. 200mm wide.

These dimensions are furnished as a guide and the clearances required in between each live bus/ link and between bus/ links to the earth (panel wall/ sheet) shall be as per relevant Indian Standard Code of practice. However, minimum clearance between neutral bus and earth shall not be less than 25mm. The panel supplier shall furnish detailed sectional drawings and also arrange to get the panel inspection done at intermediate stages of fabrication to avoid fault defective fabrication of the panels (however, the compliance of these specifications shall entirely be the suppliers' responsibility).

BUS BARS:

The bus bars shall be suitable for 3 phase, 4 wire, 415 volts 50 Hz AC supply. The bus bars shall be made of high conductivity aluminium. The bus bars shall have uniform cross-section throughout the length. The bus bars shall be designed for carrying rated-current continuously. The bus bars and links shall be designed for a maximum temperature of 75°C. The max.current density of bus bars shall be as follows:

- i. Copper : 1.86 Ampere/ Sq.mm. of cross section area.
- ii. Aluminium : 1.28 Ampere/ Sq.mm. of cross section area.

- a. It may be noted that these ratings are the upper limit to which the bus could be stressed. Suitable de-rating factors shall be applied to arrive at the correct cross section of bus bars.
- b. Bus bars shall be supported on suitable non hygroscopic, noncombustible, material such as DMC/ SMC at sufficiently close intervals to prevent bus bar sag. All bus bar joints shall be provided with high tensile steel bolts (electro plated with suitable metal such as Nickel/ Cadmium), spring washer and nuts so as to ensure good contact. Alternatively, electroplated/ tinned brass bolts shall be used. The joints shall be formed with fish-plates on either side of bus bar to provide adequate contact area. Bus supports shall be provided on either side of joints (max. unsupported distance from the joint 400mm)
- c. Power shall be distributed to feeders in dual section by a set of vertical bus bars (Phases neutral). Individual module shall be connected to the vertical bus bars through sleeved connections.
- d. Bus bars shall be insulated with PVC sleeves (heat shrink type) with colour coding (Red/ Blue/ Yellow/ Black).

- e. The bus bars and their supports shall be able to withstand thermal and dynamic stresses due to the system short-circuits. The supplier shall furnish calculations alongwith his drawing establishing the adequacy of bus bars both for continuous duty and short -circuit rating. Short circuit withstand capacity shall be for one second. Calculations for spacing of supporting of supports shall also be furnished.

1.5 EARTHING:

The panels shall be provided with a GI earth bus running throughout the width of the switchboard. Suitable earthing eyes/bolts shall be provided on the main earthing bus to connect the same to the earth grid at the site. Sufficient number of star washers shall be provided at the joints to achieve earth continuity between the panels and the sheet metal parts.

1.6 MOUNTINGS:

Panels incorporating switch fuse units shall have suitable compartments of standard width. Each compartment shall incorporate a heavy duty load break switch fuse and HRC fuses. Suitable cable termination arrangement shall be provided for switch fuse/ fuse-switch unit feeders. Equipment shall be provided with proper fastening arrangements to ensure vibration free operation. Proper designation as given on the respective drawings, shall be provided for every equipment.

Circuit breakers shall be mounted such that they are accessible from the front of the panel. More than two circuit breakers shall not be incorporated in a vertical section. The breakers compartment shall be divided into two parts, one for the breaker and the other for incorporating associated control gear. The necessary instrumentation shall be provided on the door of the compartment.

1.7 INTERLOCKING

The panels shall be provided with the following interlocking arrangements:

- a. The door of the feeder compartments is so interlocked with the switch drive or handle that the door can be opened only if the switch is in “OFF” position. De-interlocking arrangement shall also be provided for inspection.
- b. It shall not be possible for the breakers to be withdrawn when in “ON” position.
- c. It shall not be possible for the breakers to be switched “ON” unless it is either in fully inserted position or for testing purposes it in fully isolated position.
- d. The breaker shall be capable of being racked into “testing”, “isolated” and maintenance position and kept in any of these positions.
- e. A safety catch to ensure that the movement of the breaker as it is withdrawn, is checked before it is completely out of the cubicle shall be provided.

1.8 PROTECTION AND INSTRUMENTATION:

Protection and instrumentation shall be as per standard specifications.

1.9 WIRING

All the interconnections between the incoming, bus and the outgoings of 100A and above rating shall be done by insulated links/ strips of suitable sizes. Switch fuses and equipments below 100A rating shall be wired with PVC insulated copper conductors. The wiring for instrumentation protection and control equipment shall be carried out with PVC insulated flexible copper conductors.

The Power interconnections shall be carried out by means of bolted connections with washers. The wiring shall be terminated by using crimping sockets. Wiring shall be laid out neatly in bunches which are fastened to the steel members of the panel. All the potential circuits shall be protected by fuses mounted near the tap-off point from the main connections.

1.10 TERMINALS:

All the control, instrumentation and protection wiring shall be provided with printed PVC ferrules at both ends. For terminating control cables on to the equipment in the panels, suitable terminals blocks shall be provided. The terminal shall also be numbered for easy identification and maintenance.

1.11 SURFACE TREATMENT

All sheet metal accessories and components of power, control centres and switchboard panels shall be thoroughly cleaned, degreased, de-rusted and phosphatised before red oxide primer is applied. The panel shall be stove enameled to the required final finish. The interior surfaces of the panel shall also be painted to required shade. The supplier shall indicate in his offer, if there is any deviation from the treatment specified above.

1.12 ENCLOSURES

The panel enclosure shall be dust and vermin proof and shall be suitable for indoor installation. Enclosure design shall be in accordance with the requirements of IP 54 as per IS-2147-1962. The supplier shall confirm whether this requirement is met and a type test certificate furnished. If type test certificate for IP-54 is not available, the same shall be brought out clearly in his offer.

1.13 NAME PLATE

The panel as well as the feeders compartment doors shall be provided with name plates giving the switchboard/ feeder descriptions as indicated on the drawings.

1.14 TESTING

The power control centres shall be tested at factory after assembling of all components and completion of all interconnections and wiring. Tests shall be conducted in accordance with the requirements relevant IS Codes/ specifications.

a. INSULATION TEST

- i. Insulation of the main circuit, that is, the insulation resistance of each pole to the earth and that between the poles shall be measured.
- ii. Insulation resistance to earth of all secondary wiring should be tested with 1000V megger. Insulation test shall be carried out both before and after high voltage test.

b. HIGH VOLTAGE TEST :

A high voltage test with 2.5KV one minute shall be applied between the poles and earth. Test shall be carried out on each pole in turn with the remaining poles earthed. All units racked in position and the breakers closed. Original test certificate shall be submitted along with panel.

1.15 STORING, ERECTION AND COMMISSIONING

a. STORING

The panels shall be stored in well-ventilated, dry places. Suitable polythene covers shall be provided for necessary protection against moisture.

b. ERECTION

Switchboards shall be installed on suitable foundation. Foundation shall be as per the dimensions supplied by the panel manufacturer. The foundation shall be flat and level. Suitable grouting holes shall be provided in the foundation. The switch boards shall be properly aligned and bolted to the foundation by at least four bolts. Cable shall terminate on the bottom plate or top plate as the case may be, by using brass compression glands. The individual cables shall then be lead through the panel to the required feeder compartments for necessary terminations. The cables shall be clamped to the supporting arrangement. The switch board earth bus shall be connected to the local earth grid.

c. PRECOMMISSIONING TESTS :

Panels shall be commissioned only after the successful completion of the following tests. The tests shall be carried in the presence of engineer-in-charge.

- i. All main and auxiliary bus bar connections shall be checked and tightened
- ii. All wiring terminations and bus bar joints shall be checked and tightened.

- iii. Wiring shall be checked to ensure that it is according to the drawing.
- iv. All wiring shall be tested for insulation resistance by a 1000V megger.
- v. Phase sequence/ rotation shall be estimated.
- vi. Suitable injection tests shall be applied to all the measuring insuring instruments to establish the correctness and accuracy of calibration and working order.
- iii. All relays and protective devices shall be tested for correctness of settings and operation by introducing a current generator and an ammeter in the circuit.

5.0 GENERAL SPECIFICATION FOR : MOULDED CASE CIRCUIT BREAKERS

1.1 GENERAL:

Moulded case circuit breakers or fuse free breaker shall be incorporated in the switch board wherever specified. MCCBS shall conform to BS : 3871 Part II or JIS-C-8370 in all respects. MCCBS shall be suitable either for single phase 230V or three phase 415volts.

1.2 CONSTRUCTION:

The MCCB and case shall be made of high strength heat resistant and flame retardant thermo-setting insulating material. Operating handle shall be quick make/quick break, trip-free type. The operating handle shall have suitable "ON", "OFF" and "TRIPPED" indicators. Three phase MCCBS shall have a common operating handle for simultaneous operation and tripping of all the three phase. Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be of thermal-magnetic type provided on each pole and connected by a common trip bar such that tripping of any one pole actuates three poles to open simultaneously. Thermal magnetic/tripping device shall have IDMT characteristics for sustained over loads and short circuits. Contact tips shall be made of suitable arc resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearances.

1.3 ACCESSORIES:

MCCBS shall be provided with the following accessories, if specified in schedule of quantities:

- i. Under voltage release
- ii. Shunt release
- iii. Alarm Trip alarm
- iv. Auxiliary contacts.

1.4 INTERLOCKING:

Moulded case circuit breakers shall be provided with the following interlocking devices for interlocking the door of switch board:

- a. Handle interlock to prevent unnecessary manipulation of the breaker.
- b. Door interlock to prevent the door being opened when the breaker is in “ON” position.
- c. De-interlocking device to open the door even, if the breaker is in “ON” position.

1.5 RUPTURING CAPACITY:

The moulded case circuit breaker shall have a returning capacity of not less than 10KA Rms at 415 volts. Wherever required, higher rupturing capacity breakers to meet the system short circuit fault shall be used. All such ratings shall be as per equipment schedule/B.O.Q.

1.6 TESTING:

- a. Original certificate of the MCCBS as per BS:3871 or JS-C-8370 shall be furnished.
- b. Pre-commissioning tests on the switch boards panel incorporating the MCCB shall be done as per specifications.

6.0 METERING, INSTRUMENTATION AND PROTECTION

1.0 GENERAL

The Specifications hereinafter laid down shall cover all the meters, instrumentation and protective devices required for the electrical work. The ratings, type and quantity of meters, instruments and protective devices shall be as per the schedule of quantities and drawings.

2.0 INSTRUMENT TRANSFORMERS

a. Current Transformers :

Current transformers shall be in a conformity with IS:2705 (Part I, II and III) in all respects. All current transformers used for medium voltage applications shall be rated for 1 KV. Current transformers shall have rated primary current, rated burden and class of accuracy as specified in the schedule. However, the rated secondary current shall be 5A unless otherwise specified. The acceptable minimum class of various applications shall be as given below.

Measuring	:	Class 0.5 to 1
Protection	:	Class 5P10

Current transformers shall be capable of withstanding without damage, magnetic and thermal stresses due to short circuit fault of 35 MVA on medium voltage system. Terminals of the current transformers shall be paired permanently for easy identification of poles. Current transformers shall be provided with earthing terminals for earthing chassis frame work and fixed part of the metal casing (if any). Each C.T shall be provided with rating plate indicating the following:

- i. Name and Make.
- ii. Serial Number
- iii. Transformation ratio

- iv. Rated burden
- iv. Rated Voltage
- v. Accuracy class

Current transformers shall be mounted such that they are easily accessible for inspection, maintenance and replacement. The wiring for CTS shall be copper conductor, PVC insulated wires with proper termination lugs and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

b. Potential Transformers:

Potential Transformers shall be provided if specifically called for. Potential transformers shall comply with the requirements of IS: 3156 (Part I, II and III) in all respects.

3.0 MEASURING INSTRUMENTS:

a. General

Direct reading electrical instruments shall be in conformity with IS:1248. The accuracy of direct reading shall be 1/5 for Voltmeters and 1/5 for ammeters. Other type of instrument shall have accuracy of 1/5. The errors due to variations in temperature shall be limited to a minimum. The meters shall be Suitable for continuous operation between 0^oC and 60^oC. All meters shall be of flush mounting type with 144x144/96x96 sq. mm. The meter shall be enclosed in a dust tight housing. The housing shall be of ABS Body. The design and manufacture of the meters shall ensure the preventing of fogging of instrument glass. Instrument meters shall be sealed in such a way that access to the measuring element and to the accessories within the case shall not be possible. Meters shall be provided with 12.5 mm height LED display. Suitable selector switches shall be provided for all ammeters and voltmeters intended to be used on three phase supply.

b. Ammeters:

Ammeters shall be of digital LED display type. The ammeters shall be manufactured and calibrated as per the latest edition of IS : 1248. Ammeters shall be instrument transformer operated and shall be suitable for 5A secondary of instrument transformer. The ammeter shall have sensitivity of 5% minimum.

The scale shall be calibrated to indicate primary current, unless otherwise, specified. The ammeter shall be capable of carrying substantial overloads upto 120% of ratio current during fault condition without damage or loss of accuracy.

c. Voltmeters :

Voltmeters shall be of moving iron type. The range of 400 Volts, 3 Phase Voltmeter shall be 0 to 500 Volts. Suitable selector switch shall be provided for each voltmeter to read voltage between any two lines of the system. The voltmeter shall be provided with protection fuse of suitable capacity.

d. Wattmeter, Frequency Meters, Power Factor Meters:

Watt meters shall be of three phase, electronic type suitable for use with current & potential transformers associated with the particular panel. As per IS: 13779 accuracy class 1/5 IEC 61036/CB 1P - 88

ii. Power Factor Meters:

Polyphase power factor meters shall be of electronic type with current and potential coils suitable for operation with current transformers and potential transformers associated with the particular panel. The scale shall be calibrated for 50% lag-100%-50% lead readings. Phase angle accuracy shall be + 2 degrees/1 degrees.

iii. Energy meters and reactive power meters:

Tri-vector meters shall be two element, integrating type kilowatt hour, KVA kilovolt-ampere-hour reactive meters. The meters shall conform to IEC-61036/ CB 1P- 88 in all respects. Energy meters, KVA and KVARH meters shall be provided with integrating registers. The registers shall be able to record energy consumption of 500 hours corresponding to maximum current at the rated voltage and unity power factor. These meters shall be suitable for operation with current and potential transformers associated with the particular panel and can also be integrated with PC with RS4 B5 port for energy management system.

4.0 RELAYS:

a. General

Protection relays shall be provided wherever required to trip and isolate the particular section under fault. All the relays shall be provided with flag type indicators to indicate the cause of tripping. The flag indicators shall remain in position until they are reset by hand reset.

Relay shall be designed to make or break the normal circuit current with which they are associated. The relay contacts shall be of silver or platinum alloy. The contacts shall be designed to withstand repeated operation without damage. The relays shall be of draw-out to facilitate testing maintenance Draw-out case shall be dust tight with a finish suitable for tropical country. The relays shall be capable of disconnecting the faulty section of the network or fault equipment without causing interruption or disturbance to the remaining sections. The analysis of setting shall be made considering relay errors, pick-up and overshoot errors and shall be submitted to the Engineer/Architect for approval.

b. Over current Relay :

Over current relay shall be induction type with inverse definite minimum time lag characteristics. The over circuit relays shall be provided with adjustable current and time settings. The setting for current shall be 50 to 200% in step of 25%. The IDMT over current relays shall have time lag (delay) of 0 to 3 seconds. The time setting multiplier shall be adjustable from 0.1 to unity. Over current relays shall be fitted with suitable tripping device with trip coil being suitable for operation on 5Amp.

c. Earth Fault Relay:

Earth fault relay shall have current setting of 10% to 40% in steps of 10% otherwise, the earth fault relay shall conform to specification laid down for over current relays.

d. Under Voltage Relays :

Under Voltage Relays shall be induction type and shall have inverse limit operation characteristics, with pick up voltage range of 50-90% of the rated voltage.

5.0 TESTING

5.1 Instrument transformers shall be tested at factory as per IS: 2705 and IS: 3156. The test shall incorporate the following:

Routing Tests:

Original test certificates in triplicate shall be provided.

5.2 Meters shall be tested as per IS : 1248. The tests shall include routine tests. Original test certificate in triplicate shall be furnished.

5.3 Suitable injection tests shall be applied to the secondary.

- a. Circuit of every instrument to establish the correctness of calibration and working order
All relays and protective devices shall be tested to establish the correctness of setting and operation by introducing a current generator and an ammeter in the circuit.

POWER FACTOR IMPROVEMENT SYSTEM:

1.1 GENERAL:

The Power factor improvement system shall comprise of capacitors and associated switchgear and control gear as per the requirements.

1.2 CAPACITORS:

Power factor correction capacitors shall conform in all respects to IS: 2834- 1964. Capacitors shall have approval of fire insurance association of India. The capacitors shall be suitable for 3 phase 415 V, at 50 Hz frequency and shall be available in single phase and three phase units of 5, 10, 15, 20, 25 and 50 KVAR sizes. The capacitors shall be suitable for indoor use upto ambient temperature of 50⁰ C. The permissible overloads shall be as given below:-

Voltage overload shall be 10% for continuous operation and 15% for 6 hours in a 24 hour cycle.

Current overload shall be 15% for continuous operation and 50% for 6 hours in a 24 hour cycle.

Overload of 30% continuously and 45% for 6 hours in a 24 hour cycle. Capacitors shall be hermetically sealed in sturdy corrosion proof, sheet steel containers and impregnated with non-inflammable synthetic liquid. Every element of each capacitor unit shall be provided with its own built in silvered fuse. The capacitors shall have suitable discharge device to reduce the residual voltage from crest value of the rated voltage to 50 V or less within one minute after capacitor is disconnected from the source of supply. The loss factor of capacitor shall not exceed 0.005 for capacitors with synthetic impregnants. The capacitors shall withstand voltage of 2500 V ac (power frequency test voltage) for one minute. The insulation resistance between capacitors, terminals and containers when test voltage of 500V DC is applied shall not be less than 50 megohms.

CAPACITOR CONTROL PANEL:

The capacitor control panel shall generally comprise of following:

- a) Power factor correction relay
- b) Step controller with reversing motor.
- c) Time delay and no-volt relays.
- d) Contactor and fuses for individual capacitor banks.
- e) Auto- manual selector switch for either manual or automatic operation.
- f) Current Transformers (On main LT Panel)
- g) ON/OFF indicating lamps with fuses for each bank
- h) ON/OFF Push Buttons for each bank.

CONTROL PANEL:

The capacitor control panel shall be fabricated out of 2.0 mm sheet steel suitably rust inhibited and stove enameled. The panel shall have adequate space for mounting the capacitors. The panel shall be of dust and vermin proof construction with suitable ventilation arrangement for capacitors. Panels shall be dead front pattern and floor mounting type, complete with cabling arrangement, bus bars and earthing, etc. as per specification No. ELEC- 110/90.

7.0 GENERAL SPECIFICATION FOR: MEDIUM VOLTAGE CABLES

1.1 TYPE:

Medium voltage cables shall be aluminium conductor, PVC insulated, PVC sheathed and steel wire armoured or steel tape armoured construction. Aluminium conductors up to 10sq.mm. may be solid, circular in cross section, and sizes above 10sq.mm. shall be stranded. Sector shaped stranded conductors shall be used for sizes above 25sq.mm. The cable shall conform to IS 1554 (Part I).

1.2 RATING

The cable shall be rated for a voltage of 650/1100 Volts.

1.3 CONSTRUCTION

The conductors for power cables shall be made of electrical purity aluminium & that for control cable from annealed high conductivity copper. The conductors shall be insulated with high quality PVC base compound. A command covering (bedding) shall be applied over the laid up cores by extrusion or wrapping of a filling material containing unvulcanized rubber or thermoplastic material, armouring shall be applied over the inner shath of bedding, over the armouring a tough outer sheath of PVC sheathing shall be extruded. The outer sheath shall bear the manufacturers name and trade mark at every 30 meter interval.

1.4 CORE IDENTIFICATION:

Core shall be provided with the following colour scheme of PVC insulation.

- i. Core : Red/Black/Yellow/Blue
- ii. Core : Red and Black
- iii. Core : Red, Yellow, and Blue
- iv. 3.5/4 core : Red, Yellow, Blue and black.

1.5 CURRENT RATINGS :

The current rating shall be based on the following conditions.

- i. Maximum conductor temperature : 70°C
- ii. Ambient air temperature : 40°C/50°C
- iii. Ground temperature : 70°C
- iv. Depth of laying : 75cm

1.6 SHORT CIRCUIT RATING:

Short circuit ratings for the cables shall be as specified in IS : 1554 Part -I.

1.7 SELECTION OF CABLES:

Cables have been selected considering the conditions of the maximum connected load, ambient temperature, grouping of cables & the allowable voltage drop. However, the contractor shall recheck the sizes before the cables are fixed and connected to the service.

a. Storing

All the cables shall be supplied in drums. On receipt of cables at site, the cables shall be inspected and stored in drums with flanges of the cable drums in vertical position.

b. Laying

Cables shall be laid as per the specifications given below.

i. Duct system

Wherever specified cables shall be laid in underground ducts the duct system shall consist of a required number of reinforced "HUME" pipes with simplex joints. Wherever asbestos cement pipes are used, the pipes shall be enclosed in concrete of 75mm thick, the ducts shall be properly anchored to prevent any movement. The top surface of the cable ducts shall be laid with a gradient of at least 1:300. The ducts shall be provided with inspection manholes and all direction changes and at required regular intervals for drawing the cable. The manholes shall be of reinforced concrete either cast-in-situ or precast. The manhole cover and frame shall be of cast iron and machine finished to ensure a perfect joint. The manhole cover shall be installed flush with ground or paved surfaces. The duct entry to the man holes shall be made leak proof with lead-wool joints. The ducts shall be properly plugged at the ends to prevent entry of water rodents, etc. Suitable duct markers shall be placed along the run of the cable square embedded in concrete, indicating the voltages, no of ducts and the direction of run of the cable duct. Suitable cable supports made of angle iron shall be provided in the manholes for supporting the cables. Proper identification tags shall be provided for each cable in the manholes.

ii. Cables in outdoor trenches:

Cables shall be laid in outdoor trenches wherever called for. The depth of the trenches shall not less than 75cm from the final ground level. The width of the trench shall not be less than 45cm. However, where more than one cable is laid, an axial distance of not less than 15cm shall be allowed between the cables. The trenches shall be cut square with vertical side walls and with uniform depth. Suitable shoring and propping may be done to avoid caving in of trench walls. The floor of the trench shall be rammed and leveled. The cables shall be laid in trenches over the rollers placed inside the trench. The cable drum shall be rolled in the direction of the arrow for rolling. Wherever cables are bent, the minimum bending radius shall not be less than 12times the diameter of the cable. After the cable is laid and straightened, it shall be covered with 8cm thick layer of sand. Cable shall then be lifted and placed over this sand. Cable shall then be lifted and placed over this sand cushion. The cable shall then be covered with a 8 cm. Thick sand cushion. Over this, a course of cable protection tiles or burnt brick shall be provided to cover the cables 50mm on either side. Trench shall be backfilled with earth and consolidated. Cables shall be laid in Hume pipes/ stone-ware pipes at all road crossings and in CI pipes at the wall entries. Approved cable markers made of aluminium or CI indicating the voltages, no. of cables and the direction of rep. Of the cables shall be installed at a regular interval of 30 meters.

iii. Cables in indoor treanches:

Cables shall be laid in indoor treanches where specified. The trenches shall be made of brick masonry with smooth cement mortar finish. The dimensions of the

trenches shall be determined depending upon the maximum number of cables that is expected to be accommodated. Cables shall be arranged in tier formation inside the trenches. Suitable clamps hooks and saddles shall be used for securing the cables in position. Spacing between the cables shall not be less than 15cm centre to centre. Wherever specified, trenches shall be filled with fine sand and covered with RCC precast slabs or steel chequered covers. Unless otherwise called for specifically in BOQ, the making of indoor trenches is outside the scope of this work.

iv. Cable on Tray/ Racks:

Cables shall be laid on cable trays/ racks wherever specified. Cable racks/trays shall be of ladder, trough or channel design suitable for the purposes. The nominal depth of the trays/ racks shall be 150mm. The width of the trays shall be as per the design shown on drawing. The cable trays shall be made of steel or aluminium. The trays/ racks shall be completed with end plates, tees, elbows, risers, and all necessary hardware. Steel trays/ Rack shall be painted with two coats of enamel paint of approved shade over a coat of red oxide primer. Cable trays shall be erected properly to present a neat and clean appearance. Suitable cleats or saddles made of aluminium strips with PVC covering shall be used for securing the cables to the cable trays. The cable trays shall comply with following requirements:

1. The trays shall have suitable strength and rigidity to provide adequate supports for all contained cables.
2. It shall not present sharp edged, burrs or projections injurious to the insulation of the wiring/ cables.
3. If made of metal, it shall be adequately protected against corrosion or shall be made of corrosion resistant material.
4. It shall have side rails or equivalent structural members.
5. It shall include fittings or other suitable means for changes in direction and elevation of runs.

1.9 INSTALLATION

1. Cable trays shall be installed as a complete system. Trays shall be supported properly from the building structure. The entire cable tray system shall be rigid.
2. Each run of the cable tray shall be completed before the installation of cables.
3. In portion where additional protection is required, non-combustible covers/ enclosures shall be used.
4. Cable tray shall be exposed and accessible.

8.0 GENERAL SPECIFICATION FOR: LIGHTNING PROTECTION SYSTEM

1.1 SPECIFICATIONS FOR MAINTENANCE FREE EARTHING

Grounding System – Electrolytic Maintenance Free Earthing

The effective earthing connection surface should be smooth and free from paints and oxide coatings

A General

- 1 Self – contained ground electrode (s) using electrolytically enhanced grounding where specifically indicated on the drawings.
- 2 The electrode shall operate by hygroscopic ally extracting moisture form the atmosphere to activate the electrolytic process.
- 3 Electrode shall be UL ® Listed
- 4 Electrode shall be 100 % self – activating , sealed and maintenance free. No additions of chemical or water solutions required.

B. Technical Specifications

Type and Technical Specifications (Long Life Maintenance Free Earthing Solution)

Type	Soil	Warranty (Years)	Current Capacity	Electrode Details			Back Fill Qty (Bags)	Test Well Cover
				Length (feet)	Outer (inch)	Thickness (mm)		
Electrolytic Earthing	Rocky	20/30	1 kA/9Se	10	2	2	3	Polyplastic

Note: Each Bags Contain 22.6 Kg materials.

- 1 The specifications with performance warranty and technical spec details shown in the tables.
- 2 The ground rod shall be filled from the factory with non – hazardous metallic salts to form the electrolytic process and enhance the grounding performance.
- 3 Ground rod shall be a minimum of ten feet long.
- 4 2nos 40x5 mm GI Strip at the top of the electrode for the connections and inspection purpose

C. Protective Test Well

1. Polyplastic well for non – traffic applications . Includes bolt down flush cover with “breather ports”

D. Environment Friendly Backfill Material

1. Non – corrosive , electrically conductive and ground enhancing backfill. Backfill will lower the contact resistance to earth by up 63% when in conjunction with copper grounding equipment.
2. No mixing or tamping shall be required for backfill application.

E. Excavation

- 1 Bore a hole in to the earth (minimum diameter6”) Hole should be bored to allow installed unit to be as close to vertical as possible.
2. A 14” Hole must be provided for the cover box.
3. Depth of hole must be 6” deeper than the vertical length of the system.
4. Top vent ports must be left open to the atmosphere for continuous air circulations by using the protective test well provided.

F Installation

- 1 Remove sealing tapes from bottom of unit only. Tapes must be saved and made available to the electrical inspector to verify removal and proper installation. Do NOT remove the green and white “Bury to Here” marker from the top of the unit.
2. Position the unit in the hole . Use green and white “ Bury to Here marker as a guide to depth in which unit shall be buried in terraFill® . Three bags of TerraFill® are included with each 10’ electrode.
- 3 Pour BackFill® (Each bag contain 22.6Kg Materials) around electrode in augured hole . Do not mound backfill past green and white marker.
4. Place box with cover over the top of the electrode so that the cover is at grade level. Use backfill to stabilizer box around the electrode .This keeps the breather holes free of obstructions and debris. Top of box should not contact the top of the electrode.
5. Remove top sealing tape ONLY after backfill is complete . This prevents soil from blocking the vent ports.

G. Connection

- 1 Connect grounding conductor to ground rod pigtail exothermally/ Stainless steel nut and bolts.
- 2 Bury grounding conductor 30inch below grade.

SPECIFICATIOSN LIGHTING PROTECTION SYSTEM

Early Streamer Emitting Terminals are a preferred protections method for large area structures:

- Certified to UNE std 21186 and NFC std 17102 with five year warranty
- Designed and constructed as a single steel encased unit with latest advanced electronic circuitry
- No external power source required
- Withstands electrical discharge current of 100kA in field of 60kV positive and negative polarities.
- Break down time not more than 245.5µs
- Protections zone up to 800 times that of traditional single lighting rod in three zones
- Wind Resistance up to 120 miles /hours

- Produces a leader of not less than 2×10^8 V/m/s in the lightning generated electromagnetic field.
- ESE Terminal
- Down Conductor (70 Sqmm, twisted, 19 Strand bare copper cable or 25x3Cu strip)
- Lighting Counter
- Maintenance Free Grounding System

These Components should form an integral part of protections plan. Each component must be considered independently and finally integrated together to form the complete lightning protections system.

9.0 GENERAL SPECIFICATOIN FOR: FIRE ALARM SYSTEM

1. Basis of Design

An Intelligent Fire Alarm System (IFAS) shall be provided to effect total control over the life safety services required in the building. The IFAS shall be of the digital, distributed processing, real time, multitasking , multi user and multi-location type .

The IFAS provided shall be able to tie-up the following Mechanical, Electrical & Low Voltage Services into integrated system.

- a. Air Handling Units.
- b. Staircase pressurisation fans, Lift shafts and lobbies pressurisation fans .
- c. Public Address System.
- d. Lifts.
- e. Toilet Exhaust Fans.
- f. Smoke Evacuation System.

The system shall be provided with Addressable and Analog fire alarm initiating, annunciating and control devices.

The addressable and intelligent system shall be such that smoke sensors, thermal sensors, manual pull stations etc. can be identified with point address. The system shall be capable of:

- a. Setting smoke sensor sensitivity remotely to either high sensitivity manually or on a pre-programmed sequence e.g. occupied/unoccupied period. The FAS shall be able to recognise normal and alarm normal values that reveal trouble condition, and above normal values that indicate either a Fire alarm condition or the need of maintenance.
- b. Read-out or address an actual space temperature at thermal detector points. The operator shall also be able to adjust alarm and pre-alarm thresholds and other parameters for the smoke sensors.
- c. Provide a maintenance / pre-alert alarm capability at smoke sensors to prevent the detectors from indicating a false alarm due to dust, dirt etc.
- d. Provide alarm verification of individual smoke sensors. Systems that perform alarm verification on a zone basis shall not be acceptable. Alarm verification shall be printed on

the printer at the control station's printer to enhance system maintenance and identify possible problem areas .

- e. Provide local numeric point address and LED display of the device and current condition of the point. Local annunciation shall not interfere with annunciation from the Fire Control System.
- f. Provide outputs that are addressable, i.e. outputs shall have point address. The operator shall be able to command such points manually or assign the points to logical point groups (Software Zones) for pre-programmed operation.

In the event of fire alarm, but not in a fault condition, the following action shall be performed automatically.

- a. The System Alarm LED on the main fire alarm control panel shall flash .
- b. A local piezo-electric sounder shall be sounded .
- c. The LCD display on the main fire alarm control panel shall indicate all information associated with Fire Alarm condition including the type of alarm point and its location within the premises .
- d. Printing and history storage equipment shall log the information associated with the Fire Alarm Control Panel condition , along with the time and date of occurrence .
- e. All system output programs assigned via control-by-event programs that are to be activated by a particular point in alarm shall be executed , and the associated system output (alarm notification appliances and/or relays) shall be activated .
- f. The audio portion of the system shall direct the proper signal (tone or voice) to the appropriate speaker circuit .
- g. All lifts initiated through the system shall automatically be returned to ground floor .
- h. Air handling units on the affected floors shall automatically be switched OFF and simultaneously respective fire dampers shall also be closed .
- i. Staircase pressurization fan shall be put on .
- j. Toilet exhaust fan on the affected floors shall be put off .
- k. Pre-recorded alarm messages shall be played on the public address/BGM system
Start smoke evacuation system .

2. Fire Alarm Control Panel

- 2.1 The Fire Alarm Control Panels shall function both as an independent stand alone system element as well as an interface between the control processing unit and the fire detectors, their accessories and the controlled devices. The control panel shall be intelligent with its own microcomputer and memory. It shall be powered with high efficiency SMPS.
- 2.2 The Fire Alarm Panels shall be microprocessor based and shall have necessary detector interface units (for both addressable and non-addressable sensors), alarm output modules for external hooter & lamp control output modules for various control functions through relay contacts and communication modules for interfacing with the outside world. The processor shall interact with the other modules through a common bus. The system shall store all basic system functionality and job specific data in non-volatile memory. All site specific and operating data shall survive a complete power failure intact. Password shall protect any changes to system operations.

- 2.3 The Fire Alarm Panels shall have the facility to process the Input Signals and control the output functions either directly or through I/O Interface Modules as per the requirements.
- 2.4 The Fire Alarm Panels shall continuously scan the various loops for conditions of Fire, Fault (Open circuit as well as short circuit) and provide audio-visual Alarm and Messages as the case may be. Each loop shall be capable for connecting minimum 192 addressable units and at least 96 detectors .
- 2.5 System circuits shall be configured as follows: Addressable analog loops class 'A'; initiating devices circuits class 'A'; Notification appliance circuits Class A; Network communication A. Annunciates Communication 'A'. Any deviation in the style of wiring shall be with prior permission of consultant/Owner.
- 2.6 The Fire Alarm Panel shall be protected against any kind of short circuit, open circuit, over voltage and under voltage. In case of any abnormality, the system shall display appropriate message. The panel should have a CPU watch dog circuit to initial trouble should the CPU fail .
- 2.7 The system should perform Fire Pattern Recognition. For this purpose , it shall offer the following features:
- a) Smoke entering a detector for a short duration (e.g. cigarette smoke) shall not cause any alarm.
 - b) A fast build-up of smoke shall result in quick alarm generation.
 - c) A gradual build-up of smoke shall be detected early by reducing the pre-warning limit automatically (without disturbing the alarm level).
 - d) A slow build-up of dirt in detectors shall be recognised and the alarm level shall be suitably modified without generating any false alarms. For this purpose, the Fire alarm Panels shall have necessary Hardware and Software filters, details of which must be submitted by the tenderer in the technical bid.
 - e) The system shall have a UL listed detector sensitivity test feature, which will be a function of the smoke detectors and perform automatically every four hours.
- 2.8 The Fire Alarm Panels shall have the under mentioned additional features:
- a) Logging an alarm, time and action text on printer.
 - b) Status check of disabled alarm addresses before they are restored.
 - c) Storing of alarms and the possibility of internal organisation of alarms.
- 2.9 Offered Fire Alarm Panel shall have high degree of flexibility with:
- a) The possibility of expanding to a bigger system with several control panels, and control and information units .
 - b) Programmable actuation of control output relays for tripping ventilators, closing of fire doors, closing of fire dampers, etc. in case of fire. The system shall also provide a manual over-riding facility to operate/de-activate the above .

- c) Connection to addressable as well as non-addressable (Conventional) Detectors, Manual pull station, etc .
 - d) Possibility of monitoring general purpose inputs such as the level of water in overhead tanks, battery voltage, water pressure in Hydrants etc. and activating programmed equipment as per requirements such a water pumps, motors etc.
- 2.10 Fire Alarm panel shall have memory storage for last 1000 events (with date and time of occurrence) and an alarm counter for number of alarms occurred after the system is installed.
- 2.11 For reasons of reliability and preventing inadvertent changes, the software/database shall be maintained in Non-volatile Memory. It shall be possible to reprogram the software by authorised personnel only. Fire Alarm Panel shall provide Access Protection via Password (multilevel). Hard-ware protection shall be via a security lock and key arrangement.
- 2.12 Offered Fire Alarm Panels shall automatically scan the whole system and confirm the user entered configuration. It shall also generate the appropriate messages.
- 2.13 System should check up all the detectors periodically (by scanning) for the sensitivity of the detectors. Whenever any detector sensitivity goes down due to soiling or dust accumulation it should provide the required biasing to bring the detector's sensitivity upto the required level . In case any detector goes below the minimum sensitivity level, it should issue a warning tone for cleaning the detector manually. Therefore each analog detector shall be monitored for maintenance alert .
- 2.14 The system shall support distributed processor intelligent detectors with the following operational attributes; integral multiple differential sensors, automatic device mapping electronic addressing, environmental compensation, pre alarm, dirty detector identification, automatic day/night sensitivity adjustment, normal/alarm LEDs, relay bases, sounder bases and isolator bases.
- 2.15 The Fire Alarm Control Panels shall be of multiplex system using distributed memory, processing and control configured in regenerative network using a Master network controller and various field panels and remote controllers. These regenerative network shall be capable of generating critical system functions in the event of Master network controller fails or data line is severed. The network upon failure of these, shall sense the missing remote controllers or field panels and regenerate itself into a system or system dependent upon the remaining hardware. Each segment that has been regenerated shall be a full operating system capable of passing individual device or zone information to or from any remote field panel for operation of appropriate output devices and events.
- 2.16 The Fire Alarm Control Panel shall be capable of supporting interactive Colour Graphics Package (Fire Works) with 19" XGA tough screen monitor and mouse. The unit shall provide interactive control with history logging. Manual and override control of the system shall be accomplished through on screen tough switches. All the zone shall be displayed with colour coded graphics that indicate the status of each zone and its location.

- 2.17 The Fire Control shall be equipped with integrated fire fighters telephone system which shall automatically dial one or more programmed fire fighter's telephone numbers and convey pre-programmed messages in the event of fire in any of the zone. The fire panel should have a Dialer Alarm Communicator Transmitter (DACT) module to transmit alarm, supervisory and trouble signal to a Central Monitoring Station (CMS). The DACT shall support dual telephone lines, 20 pps 4/2 communication and configured for Dual Tone Multi-Frequency (DTMF) or pulse modes.
- 2.18 Indications as mentioned hereunder shall be available on the Fire Alarm Panels .
- a) RED and AMBER high power LED to indicate any zone on fire and fault respectively. Zone number and the area should be displayed on alphanumeric 8 line by 21 character (168 character total) backlit alphanumeric graphical LCD display on the control panel. Nature of fault shall also be indicated on the LCD display. The main LCD panel and operator console shall be in modular form and the same should be used as a repeater panel thus enabling full featured remote operation of the fire alarm system.
 - b) Mains-on (Green). In case of mains failure, SYSTEM ON BATTERY LIGHT (AMBER) should come up.
 - c) Battery under voltage should be indicated by flashing RED LED with 1 KHz . broken audio signal.
 - d) Other indications as per requirement and system design.
 - e) It should have the facility of for the connection of printer.
- 2.19 Matrix type connected printer should provide real time recording of all the system operations. In addition to the above, it should be able to provide Hard Copy of reports, system serviceability and faults etc. on demand .
- 2.20 The system on demand shall provide analog detector sensitivity report . The system shall also provide history report of verification cycles per detector and the system status reports of detector analog reading both on computer and VDU as well as in the form of hard copy through the printer. The system shall support the use of bar code readers to assist custom programming functions .
- 2.21 The intelligent remote driver cards in control panel shall be listed in TAC /UL /LPCB/FM/AFNOR and the panel shall have the provision for connecting 2 nos. of Mimic panels, and 4 nos. of Repeater Panels to meet feature requirements.
- 2.22 Modular system design, with a layered application design concept including an "operational layer" and a "human interface layer" to allow maximum flexibility of the system with a minimum physical size requirement. The panel should be dust and vermin proof.
- 2.23 The panel should support 128 service groups within the system program to allow the testing of the installed system based on the physical layout of the system, not on the wiring of the field circuits connected to the FACP.
- 2.24 All the metal portions of the panel shall be powder coated and earthed properly .

3. DETECTORS AND ADDRESSABLE DEVICES

3.1 General Features common to all detectors :

- a. Detector shall have an integral microprocessor capable of making alarm decisions based on fire parameters information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and analog loop controller. Detector not capable of making independent alarm decision shall not be acceptable. Maximum total analog loop response time for detectors changing state shall be 0.5 seconds. The addressable detectors shall be designed to detect one or more characteristics of fire, smoke or heat. The prime function of an addressable detector shall be to detect a fire in its early stages by one of its characteristic phenomena, both visible and invisible and convert the same into an electrical signal for initiating the local and remote alarm .
- b. The addressable detectors shall be suitable for column / ceiling mounting .
- c. The detector shall be suitable for class A (ring main) preferable or Class B (Non ring main) wiring .
- d. The detectors shall be plug-in type and shall have common base .
- e. An indicator LED shall be provided on the detector which illuminates when the detector has reached a preset alarm level. The indicator shall be operated independently of the detector from the central control panel .
- f. Provision shall be made for an output from the detector suitable for operating a remote indicator or other device with a current limitation of 4 milli-amps. The output shall be operated independently of the smoke detector from the central control panel.
- g. The detector shall be capable of operating within the following environmental limits:
Temperature operating range: 0 Deg .C to + 50 Deg .C
(without condensation) Humidity

Operating Range: 0 to 95% R .H . (without condensation)
Wind resistance upto 10 metres per second without false alarming .
- h. Separate mounting bases shall be required which enable ready removal of detectors for maintenance. The bases shall be fitted with stainless steel terminal springs and stainless steel terminal screws and saddles.
- i. The construction of the detector and bases shall be in white self-extinguishing polycarbonate plastic. Full circuitry must be protected against moisture and fungus. Smoke entry points must be protected against dust and insect ingress by corrosion resistant gauze. The detectors must be unobtrusive when installed .
- j. The installation and siting of the detectors must conform to IS:2189 .
- k. Data transmissions to and from the fire control panel from the detector shall be via a communications module which is factory fitted to a detector by the original detector manufacturer and forms a complete and integral part of the detector .
- l. The detector shall be supplied complete, fully tested and calibrated, and each should bear the serial no. and seal of the approving laboratory/body .
- m. The detector shall be capable of automatic electronic addressing/custom addressing without the use of DIP or rotary switches. Devices using DIP or rotary switches for addressing, either in the base or on the detector shall not be acceptable.

- n. There shall be facility on the mounting base for writing in indelible ink the address of that base. The address code shall be obscured from sight when detector is fitted to the base.
- o. The build-up of dirt or similar contamination on the radio-active source will cause the output signal from the detector to gradually change. The control panel shall be capable of monitoring this slow change in signal and at a predetermined level indicate that the detector is in need of servicing .
- p. The detector shall be capable of being remotely tested from the control panel by the transmission of a 3-bit code to the addressed detector. This shall result in a healthy detector transmitting back an analogue value in excess of the recommended fire alarm threshold. The control panel shall recognise this as a test signal and shall not raise an alarm against this signal. These results should also be stored in the detector.

3.2 Addressable Ionisation Smoke Detectors

- a. Ionisation smoke detectors shall respond to invisible and visible smoke and combustible gases .
- b. Ionisation smoke detectors shall have an inherently stable sensor with built-in automatic compensation for changes in ambient conditions .
- c. All electronic circuits must be solid state devices and virtually hermetically sealed to prevent their operation from being impaired by dust , dirt or humidity .
- d. All circuitry must be protected against usual electrical transients and electromagnetic interference .
- e. Reversed polarity or faulty zone wiring shall not damage the detectors .
- f. The detector shall have no moving parts or components subject to wear and tear and shall have serial no. and seal of the approving laboratory/body .
- g. All radioactive parts of the detectors shall be safeguarded against tampering. The radioactive source shall be fully gold plated .
- h. The response sensitivity of each detector shall be field adjustable to one of at least two pre-determined (factory calibrated) levels. It shall be possible to test the sensitivity of a detector in the field .
- i. The response (activation) of a detector shall be clearly visible from the outside by a flashing light of sufficient brightness .
- j. The smoke entry windows of the detector shall be field adjustable to match local air current patterns .
- k. A built-in barrier shall prevent entry of insects into the sensor .
- l. The detector shall be designed for fast and simple laboratory cleaning .
- m. The detector shall be inserted into or removed from the base by a simple push-twist mechanism to facilitate exchange for cleaning and maintenance .
- n. The manufacturer shall produce and provide test equipment allowing to test and exchange ionisation type smoke detectors upto 7 mtr . (23 ft) above floor level .
- o. The detector shall be connected to the Fire Alarm Panel via fully supervised two-wire circuit stub line (class "B" wiring) or a two wire circuit loop (Class "A" wiring) preferably .
- p. Specifications:
 - a) Normal operating temperature : 0 Deg . C to 50 Deg .C .
 - b) Relative Humidity : Max . 95% RH continuous
without condensation
 - c) Ambient air velocity : Max .15M/Sec Horizontal

d) Operating Voltage	:	24V DC nominal (18V-30V)
e) Protection category	:	IEC 529 : IP-43
f) Quiescent current	:	60 micro amps .(max)
g) Alarm current	:	100 milli amps . (max)
h) Strength of Radio	:	less than 1 micro curie active source
i) Approval by	:	NFPA/FOC/FM/UL or any other International Standard Agency.

3.3 Addressable Photoelectric Smoke Detectors

- a. The photoelectric smoke detector shall respond predominantly to light white smoke .
- b. The photoelectric smoke detectors must exhibit uniform response behaviour in course of item .
- c. The light source intensity shall automatically adjust to compensate for possible effects of dirt and dust accumulation in the sensor/lens .
- d. Smoke density in the chamber shall be measured by a symmetrical optical system .
- e. The detectors shall have no moving parts or components subject to wear and tear and shall have serial no . and seal of the approving laboratory/body .
- f. The detection principle shall employ a multiple light pulse coincidence circuit in order to prevent the false alarms .
- g. All electronic circuits must be solid state devices and virtually hermetically sealed to prevent their operations from being impaired by dust , dirt or humidity .
- h. All circuitry must be protected against usual electrical transient and electromagnetic interference .
- i. Reversed polarity or faulty zone wiring shall not damage the detector .
- j. The response sensitivity of each smoke detector shall be field adjustable to a minimum of two pre-determined (factory calibrated) levels. It shall be possible to test the sensitivity of a detector in the field .
- k. The response (activation) of a detector shall be clearly visible from the outside by a flashing light of sufficient brightness .
- l. A built-in (optional) integrated circuit shall allow the suppression of brief deceptive phenomenon .
- m. The smoke entry windows of the detector shall be field adjustable to match local air current patterns .
- n. A built-in barrier shall prevent entry of insects into the sensor .
- o. The detector shall be designed for fast and simple laboratory cleaning .
- p. The detector shall be inserted into or removed from the base by a simple push-twist mechanism to facilitate exchange or cleaning and maintenance .
- q. The detector shall be connected to the Fire Alarm Panel via fully supervised two-wire circuits stub line (class "B" wiring) or a two wire circuit (Class "A" wiring) .
- r. The manufacturer shall produce and provide test equipment allowing to test and exchange the detectors upto 7 mtr . (23 ft .) above floor leve

s. Specifications :

- a) Normal Operating Temperature: 0 Deg .C to 50 Deg .C
- b) Relative Humidity: Max .95% RH without condensation .
- c) Approval by: NEPC/FOC/FM/UL or any other international agency .

- d) Operating Voltage: 24V DC nominal (18 V-30V)
- e) Quiescent Current: 120 Micro amps maximum .
- f) Alarm current: 100 milli amps maximum .

3.4 Addressable Multi Criterion Detectors

Provide intelligent 4D multi-sensor smoke detectors. The multi-sensor analog detector shall use a light scattering type photoelectric smoke sensor, a unipolar ionization smoke sensor and an ambient temperature sensor to sense changes in air samples from its surroundings. The integral microprocessor shall employ time based algorithms to dynamically examine values from the three sensors simultaneously and initiate an alarm based on that data. The 4D Multi-sensor shall be capable of adapting to ambient environmental conditions. The temperature sensor shall self-adjust to the ambient temperature of the surrounding air and input an alarm when there is a change of 65 o F (35 o C) in ambient temperature. Systems using central intelligence for alarm decisions shall not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, age and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC or Program/Service Tool. Separately mounted photoelectric detectors, ionization detectors and heat detectors in the same location are not acceptable alternatives. The 4D Multi-sensor smoke detector shall be rated for ceiling installation at a minimum of 30ft (9.1m) centers and suitable for wall mount applications. The 4D Multi-sensor shall be suitable for direct insertion into air ducts up to 3 ft (0.91m) high and 3 ft (0.91m) wide and air velocities up to 500 ft/min. (0-2.54 m/sec) without requiring specific duct detector housings or supply tubes. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%. The integral heat sensor shall cause an alarm when it senses a change in ambient temperature of 65 o F (35 o C) or reaches it fixed temperature alarm set point of 135 o F (57 o C) nominal. The 4D Multi-sensor detector shall be suitable for operation in the following environment:

- Temperature: 32 o F to 100 o F (0 o C to 38 o C)
- Humidity: 0-93% RH, non-condensing
- Elevation : Up to 6,000 ft (1828 m)

3.5 Addressable Heat Detectors

- a. Combined rate of rise/fixed temperature heat detectors shall consists of two independent thermistors, designed to automatically compensate changes in ambient conditions
- b. All electronic circuits must be solid state devices and virtually hermetically sealed to prevent their operations from being impaired by dust , dirt or humidity .
- c. All circuitry must be protected against usual electrical transients and electromagnetic interference .
- d. Reverse polarity or faulty zone wiring shall not damage the detectors .
- e. The detector shall have no moving parts or components subject to wear and tear and shall have serial no . and seal of approving laboratory/body .
- f. It shall be possible to test the detector in the field .
- g. The response (activation) of a detector shall be clearly visible from the outside by a flashing light of sufficient brightness .

- h. The detector shall be installed into the base by a simple push-twist mechanism to facilitate exchange for cleaning and maintenance .
- i. The detector shall connect to the Fire Alarm Panel via fully supervised two wire circuit stub line (class "B" wiring) or a four wire circuit (Class "A" wiring) .
- j. It shall be possible to test the sensitivity of detector in the field .
- k. The manufacturer shall produce and provide test equipment allowing to test and exchange the detectors upto 7 Mtr . (23 ft .) above floor level .
- l. Specifications :
 - a) Normal Operating Temp : 0 Deg .C to 90 Deg .C
 - b) Approval by : NFPA/FOC or any other International Agency
 - c) Operating Voltage : 24 V DC nom . (18 v - 30V)
 - d) Quiescent current : 150 micro amps . (maximum)
 - e) Alarm current : 100 milli amps . (maximum)
 - f) Operating fixed : 75 - 80 deg .C for rate of temp . rise of 2 Deg . C/Min .and air velocity of 1 M/S.
 - g) Operating Time : 70-90 Sec . for rate of rise of 22 Deg . C/Minute & Airvelocity of 1 M/S. 180-320 second for rate of rise of 15 Deg. C ./Minute and air Velocity of 5 cm per second .

3.6 Plug-in Bases

- a. The detectors of all types shall fit into a common type of standard base .
- b. Once a base has been installed , it shall be possible to insert , remove and exchange different types of detectors by a simple push twist movement .
- c. The standard base shall be equipped with screwless wiring terminals capable of securing wire sizes upto 1.5sq.mm (SWG 15) and with built in strain limits to prevent permanent terminals deformation and weakening of contact pressure .
- d. The standard base shall be supplied with a sealing plate, preventing dirt, dust, condensation or water from the conduit reaching the wire terminals or the detector contact points .
- e. All standard bases shall be supplied with a removable dust cover to protect the contact area during installation and construction phase of the building. It must allow the inspection and verification of the zone wiring before insertion of any detectors. This dust cover shall be removable by a special tool up to 7m (23 ft) above floor level
- f. The standard base shall feature a built-in mechanism, which allows mechanical locking of any installed detector head, thus preventing unauthorised removal of tampering while maintaining.
- g. The detector contact points shall be designed to retain the detector safety and to ensure uninterrupted contact also when exposed to continuous severe vibrations .
- h. All electronic components of bases and modules must be solid state and virtually hermetically sealed to prevent their operations from being impaired by dust , dirt or humidity .
- i. All circuitry must be protected against usual electrical transients and electromagnetic interference.
- j. The standard base shall allow Snap-On insertion of an (optional) electronic module to drive remote visual alarm indicators.
- k. Reversed polarity or faulty zone wiring shall not damage the detectors.
- l. The standard base shall have a built-in alarm indicator, which is repeatable, by connecting a simple two-core wire to the base. No changes in the zone wiring shall be required to operate the additional alarm indicator.

- m. A special tool shall enable removal and insertion of dust covers or detectors by a push-twist mechanism, even if the locking device has been activated, upto 7M (23ft) height from floor level.

Bases shall be of the same make as that of the detector supplied.

3.7 Addressable Manual Pull Station

- a. Manual pull stations shall be addressable and electrically compatible with standard range of automatic detectors so that it can be connected directly into supervised loop of the standard range of control units.
- b. The manual pull station shall be of pleasant, streamlined and flat appearance permitting its use as flush and surface mounted unit as per site conditions.
- c. The Manual pull station shall consist of the base plate insert and cover with break glass type. The alarm handle shall be marked pull for FIRE.
- d. The cover must be secured against unauthorised removal. Every removal of the cover must release an alarm.
- e. All inscriptions, texts and marks must be on the manual pull station front plate.
- f. The glass must be secured in the cover against falling out.
- g. The manual pull station shall be designed for fail safe operation.
- h. The manual pull station may have a built in LED, lighting up automatically to confirm its actuation.

3.8 Addressable Monitor Modules

The monitor module shall provide address setting and shall also store an internal identifying code which the FACP shall use to identify the type of device . Modules using binary jumper or dip switch setting are not acceptable . An LED shall be provided which shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel .

3.9 Addressable Control Modules

The control module shall provide address setting and shall also store an internal identifying code which the FACP shall use to identify the type of device . Modules using binary jumper or dip switch setting are not acceptable . An LED shall be provided which shall flash under normal conditions , indicating that the monitor module is operational and in regular communication with the control panel .

3.10 Repeater Panels

- a. Each remote panel in the installed system shall include remote control and display annunciators . These annunciators shall have integral membrane style , tactile push button control switches for the control of system function and LEDs with programmable (software controlled) flash rates and slide in labels for annunciation of system events .
- b. It shall provide the system with individual zone and device annunciation also with zone or device disable .
- c. It shall provide the system with individual alarm and trouble annunciation per zone/device .

- d. It should support 8x21 characters on its LCD screen indicating current date and time , custom system title , alarm history of the system .
- e. There should be common control keys and visual indicators for; reset , alarm silence , trouble silence , drill and one custom programmable key/indicator .

3.11 Horn / Strobe

Fire alarm horn/strobe should operate from 24V L.C . and should have a facility to be selected for temporal pattern or steady tone output . The unique microprocessor based horn should be completely self-synchronized when set to temporal signal and should not require external synch control modules . A moveable jumper provided should have a choice for high (98 dbA) or low (94 dbA) outputs . The synchronized strobe should be supplied with "FIRE" (wall orientation) as the standard marking . It should be for indoor and outdoor installation.

3.12 Addressable Fault Isolator

- a. The fault isolator device shall detect and isolate a short circuited segment of a fault tolerant loop.
- b. The devices shall automatically determine a return to normal condition of the loop and restore the isolated segment.
- c. Devices shall be placed every 20 detectors / modules / field devices to limit the number lost in the event of short circuit.
- d. Systems without fault isolation capability as described above shall not contain more than 20 devices on a circuit.

4. Conductors

All cables should be ISI marked and cabling work shall be carried over as per IS and BOQ MS conduits shall be used with marking/painting shall be done to differentiate from other electrical conduits .

(C) WATER SUPPLY, PLUMBING & SANITARY INSTALLATION

The Contractor shall be responsible for the proper functioning of the Sanitary Plumbing Installation in terms of its performance. Any equipment/item having any manufacturing defect shall be replaced free of cost. The Contractor shall hand over all the catalogues, performance curves and warranty cards of the equipment supplied to the Owners.

1.0 SCOPE OF WORK

This part of the Contract shall generally include the following services:

- i) Installation of sanitary fixtures, faucets and toilet requisites.
- ii) Installation of internal water supply distribution network.
- iii) Installation of above ground drainage system.
- iv) Installation of underground drainage system including construction of manholes and all other related appurtenances.
- v) Installation of Pumping Machinery.
- vi) Fixing of inlet and outlet connections, over-flows and drain connections in the water storage tanks using puddle flanges.

The Contractor shall include for the supply, delivery, installation, connection, commissioning and testing of all materials and equipment to provide a complete sewerage, drainage and water supply installation as described hereunder.

1.1 GENERAL

1.2 STATUTORY REGULATIONS AND APPROVALS

All sanitary and water supply works shall be carried out only by those Contractors who are licensed by the concerned local authorities to execute this type of work. It shall be the responsibility of the Contractor to comply with the regulations as laid down by the local authorities. The Contractor shall also be responsible for obtaining all the statutory approvals/certificates for the work from the concerned Departments and these certificates shall be handed over to IWAI at the completion. It shall also be the responsibility of the Contractor to get the sewerage, drainage & water supply connections from the concerned authorities. However, the Owner will bear all the statutory expenditures.

1.3 SITE CONDITIONS

It is assumed that before tendering the Contractor would have visited the site and familiarized himself with all the local conditions and means of transportation and communications. No claim of whatsoever nature would be entertained at a later date on account of the Contractor's ignorance of the local conditions.

1.4 STANDARD AND CODES OF PRACTICE

The work shall be carried out as per the Specifications of Work and drawings. These specifications shall be read in conjunction with CPWD specifications, National Building Code 1983, relevant Codes of Practice and Standards as issued by Bureau of Indian Standards (B.I.S. - all with the latest amendments) wherever applicable.

1.5 WORKMANSHIP

All the work shall be carried out in a workmanship like manner and as per the best practices of the trade.

“As Built ” Drawings

On completion of the Works the Contractor shall supply three clear coloured prints of each applicable drawings, showing the exact position of all apparatus, pipe lines, services etc, together with diagrams, schedules, etc. to the Engineer-in-Charge. The word "AS INSTALLED DRAWINGS" shall be clearly indicated on all drawings adjacent to the title block.

1.6 MATERIALS

All materials to be supplied by the Contractor shall be new. All packed items shall arrive at site in original packing only. Any items found defective or damaged shall be replaced by the Contractor at his own expenses. The Contractor shall get the `seal` of containers opened from Engineer-in-Charge and maintain a record jointly signed by him and representative of Engineer-in-Charge. No empty containers shall be removed from the site till completion of work or without the written approval of Engineer-in-Charge.

1.7 STORAGE OF MATERIALS

All the materials brought at site shall be stored and stacked in a proper manner. The materials requiring protection from the Sun and rain shall be kept inside the temporary structures to be erected at site by the Contractor. The Contractor shall also follow the Manufacturers' instructions for storing and stacking the materials. The storage facilities are to be created by the Contractor at his own expenses.

1.8 INSTRUMENTS FOR MEASUREMENT AND TESTING

The Contractor shall provide, free of cost, all equipments, instruments, labour and all other allied assistance required by the Engineer-in-charge or their representative for measurement and testing of the works.

1.9 CO-ORDINATION WITH OTHER TRADES

The Contractor shall be responsible for coordinating this work with works of other trades sufficiently ahead of time to avoid unnecessary hold ups. Hangers, sleeves, recesses etc. shall be left in time as the work proceeds.

2.0 UNDER GROUND DRAINAGE

2.1 EXCAVATION

(1) Alignment and Grading

The sewers are to be laid to alignment and gradients shown on the drawings but subject to such modifications as shall be ordered by the Engineer-in-Charge from time to time to meet the requirements of the works. No deviations from the lines, depths of cuttings or gradients of sewers shown on the plans and sections shall be permitted except by the express direction of the Engineer-in-Charge.

(2) Excavation

The excavation for sewers and works shall be open cutting unless the permission of the Engineer-in-Charge for the ground to be tunneled is obtained. Where sewers have to be constructed along narrow passages, the Engineer-in-Charge may order the excavation to be made partly in open cut and partly in tunnel and in such cases the excavated soil shall be removed at once so as not to block up the passage and shall be brought back later on for refilling of the trenches or tunnels.

(3) Opening out Trenches

In excavating trenches, etc. the soling, road metalling, pavement kerbing etc. and turf is to be placed on one side and preserved for reinstatement when the trench or other excavation shall be filled up.

Before any road metal is replaced, it shall be carefully shifted. The surface of all trenches and holes shall be restored and maintained to the satisfaction of the Engineer-in-Charge and of the owners of the roads or other property traversed and the Contractor shall not cut or break down any live fence or trees in the line of the proposed works but shall tunnel under them, unless the Engineer-in-Charge shall order to the contrary.

The Contractor shall grub up and clear the surface over the trenches and other excavation of all trees, stumps, roots and all other encumbrance affecting execution of the work and shall remove them from the site to the approval of the Engineer-in-Charge.

(4) Obstruction of Roads

The Contractor shall not occupy or obstruct by his operation more than one half of the width of any road or street and if insufficient space shall then be left for public and private transit, he shall remove the materials excavated and bring them back again

when the trench is required to be refilled. The Contractor shall obtain the consent of the Engineer-in-Charge before closing any roads to vehicular traffic and the foot-walks must be kept clear at all times.

(5) Removal of Filth

All night soil, filth or any other offensive matter met with during the execution of the works, immediately after it is taken out of any trench, sewer or cess-pool, shall not be deposited upon the surface of any street or where it is likely to be nuisance or passed into any sewer or drain but shall be at once put into carts and removed to a suitable place to be provided by the Contractor.

(6) Excavation to be Taken to Proper Depths

The trenches shall be excavated to such a depth that the sewers shall rest on concrete as per specifications and drawings so that the inverts may be at levels given on the sections. In bad ground the Engineer-in-Charge may order the Contractor to excavate to a greater depth than that shown on the drawings and to fill up the excavation to the level of the sewer with concrete, broken stone, gravel or other materials. Any such extra excavation, if ordered by the Engineer-in-Charge, shall be extra as per provisions in the Contract conditions, but if the Contractor should excavate the trench to a greater depth than is required as per drawings without a specific order to that effect of the Engineer-in-Charge, the extra depth shall have to be filled up with concrete at the Contractor's own costs and charges to the requirements and satisfaction of the Engineer-in-Charge.

(7) Refilling

After the sewer or other work has been laid and proved to be watertight, the trench or other excavations shall be refilled. Utmost care shall be taken in doing this, so that no damage shall be caused to the sewer and other permanent work. The filling in the haunches and upto 75 cm above the crown of the sewer shall consist of the finest selected materials placed carefully in 15 cm layers and flooded and consolidated. After this has been laid, the trench and the other excavation shall be filled carefully in 150 mm layers with materials taken from the excavation, each layer being watered for proper consolidation unless the Engineer-in-Charge shall otherwise direct.

(8) Contractor to Restore Settlements and Damages

The Contractor shall, at his own costs and charges, make good promptly during the whole period of the works are in hand, any settlement that may occur in the surfaces of roads, berms, footpaths, gardens, open spaces, etc. whether public or private, caused by his trenches or his other excavations and he shall be liable for any accidents caused thereby. He shall also, at his own expense and charges, repair and make good any damage done to buildings and other property. If in the opinion of the Engineer-in-Charge, the Contractor fails to make good or pay or satisfy the expenses of making good such works / property, the Engineer-in-Charge shall be at liberty to get the work done by other means and the expenses thereof shall be paid by the Contractor or

deducted from any money that may be or become due to him or recovered from him in any other manner according to the conditions of the contract.

(9) Disposal of Surplus Soil

The Contractor shall at his own costs and charges, provide places for disposal of all surplus materials not required to be used on the works. As each trench is refilled, the surplus soil shall be immediately removed, the surface properly restored and roadways and sides left clear.

(10) Timbering of Sewer & Trenches

The Contractor shall at all times support efficiently and effectively the sides of the sewer trenches and other excavations by suitable timbering, piling and sheeting and they shall be close timbered in loose or sandy strata and below the surface of the subsoil water level, without any extra cost.

All timbering, sheeting and piling with their wallings and supports shall be of adequate dimensions and strength and fully braced and strutted so that no risk of collapse or subsidence of the walls of the trench shall take place. The Contractor shall be held responsible and accountable for the sufficiency of all timbering, bracing, sheeting and piling used for, all damage to persons and property resulting from the improper quality, strength, placing, maintaining or removing of the same.

(11) Removal of Water from sewer

The Contractor shall at all times, during the progress of work, keep the trenches and excavations free from water which shall be disposed of by him in a manner as will neither cause injury to the public health nor to the public or private property nor to the work completed or in progress nor to the surface of any roads or streets, nor cause any interference with the use of the same by the public.

(12) Width of Trenches

Unless specified otherwise by the Engineer-in-Charge, the width at bottom of trenches for pipes of different diameters laid at different depths shall be as given below:-

- a) For all diameters, upto an average depth of 120 cm, width of trench in cm = diameter of pipe + 30 cm.
- b) For all diameters or depths above 120 cm; width of trench in cm = diameter of pipe + 40 cm ; and
- c) Notwithstanding (a) and (b), the total width of trench at the top should not be less than 75 cm for depths exceeding 90 cm.

2.2 SALT GLAZED STONEWARE PIPES

(1) Specifications

Wherever specified for drainage/sewer lines, salt glazed stoneware pipes shall be used. These pipes shall be of first quality, straight, free from any roughness inside or outside and conforming to IS: 651-1980.

(2) Laying

The pipes shall be laid on a bed of 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix or as specified, with sockets leading uphill and should rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipes jointer room to work right round the pipes and as short as practicable to admit the socket and allow the joint to be made.

If the bottom of the trench of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on concrete cradles to ensure even bearing.

The pipes shall be surrounded with 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix all around.

(3) Jointing

Tarred gasket of hemp yarn soaked in thick cement slurry shall first be placed round the spigot of each pipe and the spigot then shall be slipped home well into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and the gasket caulked home so as to fill not more than one fourth of the total depth of the socket.

The remaining depth of the socket shall then be filled with a stiff mixture of cement mortar 1:1 (1 cement: 1 fine sand). When the socket is thus filled, a fillet shall be formed round the joint with a trowel forming an angle of 45 with the barrel of the pipe.

2.3 UPVC PIPES FOR UNDERGROUND DRAINAGE

(1) Specifications

Wherever specified for underground drainage/sewer lines, UPVC pipes and fittings (orange brown in colour) shall be used. These pipes shall be conforming to IS:15328 or ISO:4435&ISO:3633

(2) Laying

The pipes shall be laid on a bed of 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix or as specified,

If the bottom of the trench is rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on concrete cradles to ensure even bearing.

The pipes shall be surrounded with either a) pea gravel till 15 cm above the crown of the pipe or b) 15cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix all around, as specified.

(3) Jointing

The pipes and fittings shall be jointing with water tight proprietary sealing rings

2.4 CAST IRON PIPES

(1) Specifications

Wherever specified, the cast iron pipes for drainage shall be centrifugally cast spun iron type conforming to IS: 1536 - 1976. Class LA, A or B as required by the Engineer in charge.

Generally, all drainage lines passing under buildings, floors, roads with heavy traffic and in exposed position above ground or like situations shall be in cast iron of the above specifications.

(2) Laying and Jointing

All excavation work for laying cast iron drainage pipes shall be done as above.

The spigot of the pipe shall be placed inside the socket and gasket caulked home. The interior of the socket and exterior of the spigots shall be thoroughly cleaned and dried. The spigot end shall be inserted into the socket right upto the back of the socket and carefully centered by two or three laps of treated spun yarn, twisted into ropes of uniform thickness, well caulked into the back of the socket to leave the depth for the required quantity of lead. Molten pig lead shall then be poured into the joint filling the same in one pouring. The lead shall be caulked by proper tools to make it even around. The pig lead shall conform to IS:782-1978.

2.5 REINFORCEMENT CEMENT CONCRETE PIPES

(1) Specifications

Wherever specified for drainage/sewer lines, reinforcement cement concrete pipes shall be used. These pipes shall be suitable for semi fluid These pipes shall be of first quality, straight, free from any roughness inside or outside and conforming to IS: 458-1988, NP2 or NP3 grade as specified in the Bill of Quantities.

(2) Laying

The pipes shall be laid on a bed of 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix or as specified, with sockets leading uphill and should rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow

the pipes jointer room to work right round the pipes and as short as practicable to admit the socket and allow the joint to be made.

If the bottom of the trench of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on concrete cradles to ensure even bearing.

The pipes shall be surrounded with 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate of 40 mm nominal size) mix all around.

(3) Jointing

The joint is composed of specially shaped spigot and socket ends on concrete pipes. A rubber ring shall be placed on the spigot which shall be forced into the socket of the pipe previously laid. This compresses the rubber rings as it rolls in to the annular space formed between the two surfaces of spigot and the socket, stiff mixture of cement mortar 1:2 (1 cement : 2 fine sand) shall then be filled into the remaining annular space and rammed with a caulking tool. After day's work any extraneous materials shall be removed from the inside of the pipe and newly made joint shall be cured.

2.6 MANHOLES

(1) General

The Contractor shall construct all manholes, chambers, etc. in first class brick work to such levels, dimensions and specifications as shown in the drawings or as specified in the Bill of Quantities.

(2) Base Concrete, Benching and Channels

All manholes shall have a base of cement concrete 1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size) 200 mm thick or as shown on drawings. Channeling and benching shall be formed to the full depth of the diameter of the pipe with cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement.

(3) Masonry Work

Masonry work shall be done with first class bricks in cement mortar 1:5 (1 cement: 5 fine sand). All manholes shall be plastered 12 mm thick inside with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement. Manholes shall be plastered outside with cement mortar 1:4 (1 cement: 4 coarse sand).

(4) Cast iron Steps

All manholes above 800 mm depth, shall have cast iron of standard pattern foot rests and spaced 300 mm vertically or as shown on drawings. The steps may be set staggered in 2 vertical runs which may be 380 mm apart horizontally. The topmost step shall be 450 mm below the manhole cover and the lowest not more than 300 mm above the benching.

(5) R.C.C. Slab

C.I. frames and covers of the specified size and weight shall be embedded in reinforced cement concrete slab 1:2:4 (1 cement : 2 coarse sand : 4 graded stone

aggregate 20 mm nominal size) 15 cm thick, reinforcement shall consist of 12 mm dia. M.S. bars of 15 cm centre to center (bothways). Additional bars shall be provided under the C.I. frame.

(6) Size of Manholes and Covers

Size of manholes and manhole covers shall be as follows unless otherwise specified in the Bill of Quantities:

Size of Manhole (inside dimensions)	Size and total weight of cover and frame	
1. Manhole not exceeding 0.9 m depth	900 x 800 mm	600 x 450 mm (inside) S.F.R.C. cover
2. Manhole exceeding depth 0.9 m S.F.R.C.	1200 x 900 mm	<u>Medium Duty</u> Dia-500 mm inside, made of
3. Manhole exceeding depth 0.9 m S.F.R.C.	900 mm circular	Heavy Duty Dia-500 mm inside, made of
4. Manhole exceeding depth 1.67 m S.F.R.C.	1200 mm circular	Heavy Duty Dia-500 mm inside, made of
5. Manhole exceeding depth 2.29 m S.F.R.C.	1500 mm circular	Heavy Duty Dia-500 mm inside, made of

(7) Drop Manholes

Where it is impracticable to arrange the connection within 60 cm height above the invert of the manhole, the connection shall be made by construction of a vertical shaft outside the manhole chamber as shown in the detailed drawings. If the difference in level between the incoming drain and the sewer does not exceed 60 cm and there is sufficient room in manhole the connecting pipe may be directly brought through the manhole wall and fall accommodated by constructing a ramp in the benching of the manhole.

All manhole covers shall fit properly and bed evenly without rocking in their frames. Covers shall be sealed with grease upon final completion and testing.

(8) Lifting Keys

A set of lifting keys for each type of manhole cover shall be supplied by the Contractor.

2.7 RAIN WATER COLLECTION CHAMBER

The chamber shall be of brick masonry as specified in 3.5 (3) and shall have a polycrrete / ferrocement grating with frame on top and C.I. grating with frame on side, both fixed in 15

cm thick cement concrete 1 : 2 : 4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size). The size of the chamber shall be taken as the clear internal dimensions of the polycrrete/ ferrocement frame. The chamber shall have a connection pipe, the length of which in metre between the road gully chamber and the manhole of the drain shall not be less than one by forty (1/40) times the nominal diameter of pipe in mm (i.e. for 150 mm connection pipe, length shall not be less than 3.7 m and for 250 mm connection pipe length shall not be less than 6.25 m). The chamber shall be built at the location as shown on drawing or as fixed by the Engineer-in-Charge considering the site conditions.

3.0 EXTERNAL WATER SUPPLY

3.1 GALVANISED IRON (G.I.) PIPES FOR DOMESTIC WATER SUPPLY (INCLUDES MUNICIPAL SUPPLY UPTO UNDER GROUND RESERVOIR)

(1) Specifications

Where specified G.I. pipes for water supply inside and outside the building shall be genuine galvanised steel tubes conforming to IS:1239(Part-I)-1979 of specified grade with latest amendments.

All fittings shall be malleable iron galvanised fittings conforming to IS:1879(Part-1 to 10)-1975 with latest amendments. All fittings shall have manufacturer's trade mark stamped on it. Fittings in G.I.pipe lines shall include elbows, tees, bends, reducers, nipples, union, bushes, G.I. clamps of approved design, G.I. flanges with 3 mm rubber insertion, nuts, bolts, washers, etc. All fittings shall be tested at manufacturer's work. Contractors may be required to produce certificate to this effect from the manufacturers.

(2) Laying and Jointing

All excavation work for laying G.I. pipes shall be done as described in section 3.1 in general. However, the special care must be taken to ensure that the hard objects like stones, rock pieces, tree roots etc. are not present. Pipes shall be bedded in sand or soft soil free from rock and gravel. Backfill upto 15 cm above the pipe shall also be of fine sand (conforming to grading zone V) or soft soil. Pipes shall be protected by painting two coats of anti-corrosive bitumastic paint over a coat of primer. All the pipe surfaces shall be thoroughly cleared and dried before the application of the primer and shall be free of dirt, grease, oil, rust, scale or other foreign matter. The width of the trench shall be outside diameter of the pipe plus 30 cm. Pipes shall be laid atleast 90 cm. below the ground level (measured from surface of the ground to the top of pipe).

Screwed G.I. pipes shall be jointed with screwed socket joints, using screwed fittings. Care shall be taken to remove any burr from the end of the pipes after cutting. White lead with grummet of a few strands of fine hemp shall be applied while tightening. Other pipe jointing compound may be permitted if approved by the Engineer-in-Charge before starting the work. All pipes shall be fixed with G.I. holder bat clamps clear off the wall. If pipes are fixed in chases they shall be fixed in position by iron hooks. All piping shall be kept plugged at the end of day's work.

3.2 VALVE CHAMBER

(1) Construction

Base concrete, masonry work and plastering shall be as described under sub-section MANHOLES.

(2) Size

The size of the valve chamber shall be as specified in the Bill of Quantities.

4.0 SOIL, WASTE AND VENT PIPEWORK

4.1 U.P.V.C. PIPES AND FITTINGS

(1) Specifications

Internal foul drainage pipework and fittings shall be of UPVC. Pipes of diameter 75 mm and above shall be confirming to **IS:13592 Type-B** and shall be of type commercially known as UPVC SWR system. Pipes of diameter 63mm and smaller shall be of pressure rating minimum 6 kg/sq.cm. Fittings in general shall be injection moulded and suitable for soil, waste and rain water drainage application. However, specials can be fabricated using pipes and fittings described above. All pipework fittings and accessories shall be installed strictly in accordance with the manufacturer's recommendations. The Contractor shall ensure that the UPVC pipes are of a sufficiently high temperature rating to withstand the environmental conditions.

(2) U.P.V.C Pipework Installations

During the installation of internal drainage and waste system, the Contractor shall make due allowance for the expansion of UPVC and polypropylene pipework and fittings during normal working conditions. Further allowance shall be made for solvent weld jointing of the above materials with regard to temperature and humidity.

The bore of all pipework shall be smooth and free from all burrs or obstructions; bends wherever possible shall be of the long radius type.

All connections between soil drainage, vent, waste or fixtures shall be made with approved connectors. The termination at high level of all vent stacks shall be carried out with a vent guard.

All fixtures and fittings draining into the internal drainage installations shall be fitted with traps. In case of traps for sanitary fixtures e.g., hand wash basins, sinks etc., shall be of the deep seal type having a water seal of 50 mm.

Traps to sanitary fittings shall have deep seals of at least 50 mm depth of water and shall have inlet sizes as follows:

	Wash Basins	-	32 mm
Sinks	-	40 mm	
	Bath Tubs	-	40 mm

Pipework shall be fixed accurately to approved falls, the gradient shall be consistent and pipework shall follow a true line. Allowance shall be made for the rodding of the whole installation in addition to which, at all changes of direction, a rodding eye shall be installed.

The pipework shall be fixed to the walls using standard PVC coated mild steel or PVC brackets of a screw-on type recommended by the manufacturers.

The maximum spacing between the supports shall be as follows:

Pipe Diameter	Horizontal	Vertical
32 mm	1.00 M	1.25 M
40 mm	1.00 M	1.25 M
50 mm	1.00 M	1.25 M
110 mm	1.25 M	2.00 M

The Contractor shall provide access or rodding eyes wherever required to provide full access to the system. The rodding eye shall also be provided at the foot of all vertical stacks at the point of connection to the underground drain pipe.

Access doors in suspended pipework within 0.5 M of the soffit shall not face upwards but be located on the side or underneath the pipe.

Where traps, access branches and access doors are located above false ceiling, removable panels shall be provided.

Soil and waste ventilation pipes passing through roofs shall be weather proofed to the satisfaction of the Engineer-in-Charge.

The vent pipes shall be carried upto a minimum height from finished roof level of 500 mm to prevent any pressure fluctuations in the stack due to wind effect.

Connections to the outlets of the water closets shall be made by the use of proprietary UPVC WC connectors.

Generally vent and anti-syphonage pipes and fittings shall be installed above the flood level of the fitting wherever possible.

The whole of the installation shall be tested in accordance with the requirements of CPWD and Bureau of Indian Standards, specifications. All tests shall be to the full satisfaction of the Engineer-in-Charge.

(3) U.P.V.C. Floor Traps

Floor traps shall be UPVC deep seal type 'P' traps with a minimum seal of 50 mm. They shall be with or without vent as required.

(4) U.P.V.C. Floor Trap Extension Piece

Wherever mentioned, floor trap shall be provided with UPVC extension piece. Length of the extension piece shall be as per the site conditions. Extension piece shall be formed out of boss pipe as per standard details and drawings.

4.2 CAST IRON PIPES AND FITTINGS

(1) Specifications

If specified, centrifugally cast (spun) iron pipes & fittings conforming to IS:3989-1979/sand cast iron pipes & fittings confirming to IS:1729-1979 shall be used for soil, waste and vent pipework unless specified otherwise. Pipes and fittings with irregular bore, blow holes and other manufacturing defects shall not be allowed to be used for work. All fittings shall be of the degree specified or as required at site.

All pipework shall be carried out in workmanship like manner following CPWD Specifications in general.

(2) Fixing

All vertical pipes shall be fixed by M.S. Clamps truly vertical. Branch pipes shall be connected to the stack at the same angle as that of the fittings. No collars shall be used on vertical stacks. Each stack shall be terminated at top with a cowl (Terminal Guard). Horizontal pipes running along ceiling shall be fixed on structural adjustable clamps of special design shown on the drawings or as directed. Horizontal pipes shall be laid to uniform slope and the clamps adjusted to the proper levels so that the pipes fully rest on them.

Contractor shall provide all sleeves, openings, hangers, inserts during the construction. He shall provide all necessary information to the building Contractor for making such provisions in the structure as necessary. All damages shall be made good to restore the surfaces if the above are not incorporated in time and provided afterwards by cutting walls and slabs.

(3) Cast Iron Floor Traps

Floor traps shall be cast iron deep seal type 'P' or 'S' traps with a minimum seal of 50 mm. They shall be with or without vent.

(4) Floor Trap Extension Piece

Wherever mentioned, floor trap shall be provided with G.I. extension piece. Length of the extension piece shall be as per the site conditions. On this extension piece, sockets of suitable diameters shall be welded at the required angle as per the drawing and site conditions. This extension piece shall be lead caulked into the collar of 'P'/'S' trap.

(5) Installation of Cast Iron, Soil, Waste and Ventilation Pipe Work

i) Gradient

The gradient of a horizontal branch should not be flatter than 1 in 50 and not steeper than 1 in 10.

ii) Layout

The pipework in branch connections should always be arranged to allow free drainage of the system. Connections to main or branch pipes should be so arranged as to prevent cross flow from one appliance to another. Connections should be made with an easy sweep in the direction of flow.

iii) Joint

All joints in pipe work and all pipe work to appliances should be made in such a manner as to be air-tight and water tight and to remain so during use.

iv) Bends

Bends should be of long radius where practicable. In the case of bends in the bottom most pipes, they should necessarily be of long radius and should be preferably be made of 135 degree (1/8) bends.

v) Access

Ample provision should be made for access to all pipe work and embedding of joint in walls should be avoided as far as possible. All tee and cross pieces shall be with access doors. Wherever instructed by the Consultant, the bends with access doors shall also be provided. The bottom most pipe of every soil and waste stack shall be provided with an access piece at a height not more than 30 cm from the finished ground level.

vi) Soil pipes

Soil Pipes, whether inside or outside the building, shall not be connected with any rain water pipe and there shall not be any trap in such soil pipe or between it and any drain with which it is connected.

vii) Ventilating Pipe

a) Ventilating pipes should be so installed that water cannot be retained in them. They should be fixed vertically. Whenever possible, horizontal runs should be avoided. Ventilating pipe shall be carried to such a height and in such a position as to afford by means of the open end of such pipe or vent shift, a safe outlet of foul air with the least possible nuisance.

- b) The upper end of the main ventilating pipe may be continued to the open air above roof level as separate pipe or it may joint the MSP and/or MWP above the floor level of the highest appliance. Its lower end may be carried down to join the drain at a point where air relief may always be maintained.
- c) Branch ventilating pipes should be connected to the top of the BSP and BWP between 75 mm and 450 mm from the crown of the trap.
- d) The ventilating pipe shall always be taken to a point 150 cm above the level of the leaves or flat roof or terrace parapet whichever is higher or the top of any window within a horizontal distance of 3 m. The least dimension shall be taken into account. The upper end of every ventilating pipe shall be protected by means of a cowl.

viii) Concrete Encasing

All soil and waste pipes horizontally laid in toilets (but not in open ducts) shall be covered with 75 mm thick cement concrete 1:2:4 all around. Encasement of such pipes shall be done after testing of pipes and shall be paid extra.

ix) Painting

All pipes in ducts and exposed position shall be painted with minimum two coats of enamel paint of approved shade and quality over a coat of primer. Pipes under floor or in chases need not be painted.

4.3 CLEAN OUTS

Clean outs shall be provided in the soil, waste and vent pipework as per the standard details wherever shown on the drawings and wherever required by the Engineer-in-Charge.

4.4 VENTILATION SYSTEM

- i) Ventilating pipes shall project through walls or roofs to vent into the open air at the points shown on the drawings. The ventilation pipes shall be fitted with balloon at the top.
- ii) No vent terminal shall be directly beneath any door, window or other ventilating openings of the building, nor shall any such vent terminal be within 3 M horizontally of such an opening unless it is 60 cm above the top of such an opening.
- iii) All vent and branch vent pipes shall be so graded and connected as to drip back to the soil or waste pipe by gravity.
- iv) Where vent pipes connect to horizontal soil or waste pipes, the vent pipes shall be taken off above the centre line of the pipe. The vent pipes shall rise vertically or at an angle not more than 45° from the vertical to a point at least 150 mm above the floor level rim of the fixture it is venting before off-setting horizontally or before connecting to the branch vent.
- v) A connection between a vent pipe and vent stack or stack vent shall be made at least 150 mm above the flood level rim of the highest fixtures served by the vent. Horizontal vent

pipes forming branch vents, relief vents or loop vents shall be at least 150 mm above the flood level rim of the highest fixture served.

4.5 RAIN WATER PIPES

Pipes for the conveyance of the rain water from the roof top, balcony etc. shall generally be, unless otherwise specified, as soil, waste and vent pipes.

Rain water outlets shall be formed using standard UPVC flanged roof outlets, clamping flange and screwed down grating. The gaps between outlet and roof slab shall properly sealed.

4.6 PIPE SLEEVES

The Contractor shall install sleeves for all piping passing through slabs, beams, walls or any other building member. The sleeves shall be fixed in formwork before pouring of concrete. In foundations and walls the sleeves shall be properly grouted and the gap between sleeve and building member shall be made water tight.

All sleeves shall be of PVC.

4.7 FLASHINGS

Pipes extending through roof shall be flashed with sheet lead, copper or other durable material to make the roof water tight.

Complete shop drawing of method of dressing, as may be required by the Engineer-in-charge, shall be submitted for his approval prior to installation. Alternatively, up stands with precast concrete slab covers shall be provided as per standard detail.

5.0 DOMESTIC WATER SERVICES

5.1 G.I. PIPE WORK

G.I. pipes for water supply inside and outside the building shall be genuine galvanised steel tubes conforming to IS:1239(Part-I)-1979 of specified grade with latest amendments.

All fittings shall be malleable iron galvanised fittings conforming to IS:1879(Part-1 to 10)-1975 with latest amendments. All fittings shall have manufacturer's trade mark stamped on it. Fittings in G.I.pipe lines shall include elbows, tees, bends, reducers, nipples, union, bushes, G.I. clamps of approved design, G.I. flanges with 3 mm rubber insertion, nuts, bolts, washers, etc. All fittings shall be tested at manufacturer's work. Contractors may be required to produce certificate to this effect from the manufacturers.

All pipework for water supply (both hot and cold) inside the building shall be carried out in a workmanship like manner following CPWD specifications in general. All materials shall be as specified in these specifications, bills of quantities and drawings. In case specifications of a material is not mentioned or not clear in the above, the reference shall be made to CPWD specifications and the relevant Indian Standards/codes.

5.2 CPVC PIPE WORK

Wherever specified, CPVC piping system for water supply system shall be SDR 11 rated and of approved makes. All pipes and fittings shall comply with ASTM D 2846 standard.

All fittings shall be injection moulded. CPVC to CPVC jointing shall be fusion bonding type (Solvent Cement Type) using proprietary CPVC fusion compound. Transition fittings (for making connections with valves, faucets, other appurtenances and non CPVC pipes) shall have brass insert having threads as per IS: 554. **CPVC threaded fittings are not to be used.**

All CPVC pipework for water supply (both hot and cold) inside the building shall be carried out in a workmanship like manner as per the manufacturer's recommendations. All materials shall be as specified in these specifications, bills of quantities and drawings. All the brass threaded adaptors and specials shall be jointed properly using Teflon tape. For storage, cutting, jointing, installing and testing of CPVC material, manufacturer's instructions shall be strictly adhered to.

Solvent Cement : The jointing of pipes and plain fittings shall be by solvent cement of make and grade as specified and supplied by the manufacturer of CPVC piping system. It shall be insured that the solvent supplied is not used beyond the expiry period as mentioned on the packaging of the material.

HORIZONTAL SUPPORTS SPACING:

DIA	SPACING IN METRE AT WORKING TEMPERATURE			
	23 ⁰ C	38 ⁰ C	60 ⁰ C	82 ⁰ C
½ “	1.22 M	1.07 M	1.07 M	0.92 M
¾”	1.53 M	1.37 M	1.22 M	0.92 M
1”	1.68 M	1.53 M	1.37 M	0.92 M
1 ¼”	1.83 M	1.68 M	1.53 M	1.22 M
1 ½”	1.98 M	1.83 M	1.68 M	1.22 M
2”	2.29 M	2.14 M	1.98 M	1.22 M

Curing Time: After the CPVC installation is completed, adequate time as per following schedule shall be provided for the curing of the of the joints before subjecting the system to pressure testing or putting it to use:

Ambient Temperature	Pipe Sizes	Pipe Sizes
	½' – 1 ¼"	1 ½" – 2"
Above 16 ⁰ C	½ hr.	1hr.
From 5 ⁰ C – 16 ⁰ C	1hr.	2hr.
Below 5 ⁰ C	3hr.	6hr.

5.3 PVC PIPE WORK

Wherever specified, PVC piping system for water supply system shall be approved makes. All pipes shall comply with ASTM- D1785-SCH. 40 standard and fittings shall comply with ASTM-D2467- SCH. 80.

All fittings shall be injection moulded. PVC to PVC jointing shall be fusion bonding type (Solvent Cement Type) using proprietary PVC fusion compound. Transition fittings (for making connections with valves, faucets, other appurtenances and non PVC pipes) shall have brass insert having threads as per IS: 554. **PVC threaded fittings are not to be used.**

All PVC pipework for water supply (cold) inside the building shall be carried out in a workmanship like manner as per the manufacturer's recommendations. All materials shall be as specified in these specifications, bills of quantities and drawings. All the brass threaded adaptors and specials shall be jointed properly using Teflon tape. For storage, cutting, jointing, installing and testing of PVC material, manufacturer's instructions shall be strictly adhered to.

Solvent Cement : The jointing of pipes and plain fittings shall be by solvant cement of make and grade as specified and supplied by the manufacturer of PVC piping system. It shall be insured that the solvent supplied is not used beyond the expiry period as mentioned on the packaging of the material.

HORIZONTAL SUPPORTS SPACING:

DIA	SPACING IN METRE AT WORKING TEMPERATURE			
	23 ⁰ C	38 ⁰ C	60 ⁰ C	82 ⁰ C
½ "	1.22 M	1.07 M	1.07 M	0.92 M
¾ "	1.53 M	1.37 M	1.22 M	0.92 M
1 "	1.68 M	1.53 M	1.37 M	0.92 M
1 ¼ "	1.83 M	1.68 M	1.53 M	1.22 M
1 ½ "	1.98 M	1.83 M	1.68 M	1.22 M
2 "	2.29 M	2.14 M	1.98 M	1.22 M

Curing Time: After the PVC installation is completed, adequate time as per following schedule shall be provided for the curing of the of the joints before subjecting the system to pressure testing or putting it to use:

Ambient Temperature	Pipe Sizes	Pipe Sizes
	½' – 1 ¼"	1 ½"– 2"
Above 16 ⁰ C	½ hr.	1hr.
From 5 ⁰ C – 16 ⁰ C	1hr.	2hr.
Below 5 ⁰ C	3hr.	6hr.

5.4 POLYPROPYLENE PIPES RANDOM (PP-R) PIPE WORK

Where specified PP-R pipes and moulded fittings for water supply inside the building shall be PN 16 rated (minimum). PP-R pipe and fittings shall be made from PP-R resin conform to International DIN 8077/8078.

All pipework for water supply (both hot and cold) inside the building shall be carried out in a workmanship like manner as per the manufacturer's recommendations. All materials shall be as specified in these specifications, bills of quantities and drawings. The jointing of pipes and moulded fittings shall be by heat fusion jointing. The jointing apparatus shall be piping system meant if specified or directed at site, the Polypropylene Randon Copolymer (PP-R) piping system may be used for water supply system. The piping system shall be suitable for both cold an hot potable water supply. The pipes and fittings shall be extruded / moulded from the virgin raw materials.

The pipes and fittings shall meet the following minimum requirements:

Pipes — Minimum PN 16 Pressure Class

Fittings — Minimum PN 25 Pressure Class

Standards:

Sizes : As per DIN 8077

Quality Assurance : As per DIN 8078

Fittings with threaded metal inserts : As per DIN 2999

5.5 INSULATION OF HOT WATER PIPES

(1) Mineral Wool Based Insulation

All hot water pipework in exposed type locations shall be insulated with snap-on mineral wool preformed pipe sections, unless directed otherwise by the Engineer-in-charge. The mineral wool sections shall have a density shall have a density of 144 kg/cum and thermal conductivity ('K value) of 0.029 W/mk at 50⁰C. The thickness of

section shall be 25 mm for pipe diameters upto 50 mm and 40 mm for pipe diameters above 50 mm.

Before fixing insulation, the pipe surface shall be cleaned of dust and oil. A coat of zinc chromate primer shall be applied on the clean surface and then the preformed pipe section shall be snapped on G.I. wire mesh of size 24G x ¾" shall be stitched on the insulations, followed by 12 mm cement plaster (1:4) in 2 layers of 6 mm each.

(2) Concealed Pipework

All hot water G.I. pipes (both concealed in walls / floors) should be insulated by wrapping 6 mm thick insulating rope. After wrapping the asbestos rope over hot water pipes, finishing should be done by 12 mm thick coat of 85% magnesia.

(3) Synthetic Rubber Polymeric Compound Insulation

As an alternate to mineral wool insulation for hot water supply pipes may be insulated with extended Synthetic Rubber Polymeric Compound Pre form pipes sleeve, if directed by the engineer incharge. The pipes sleeves shall be fixed using propriety adhesive and self-adhesive tapes, all as per the manufacturer's specifications.

(4) Exposed Pipework

The insulation of the exposed pipework shall be done with extended synthetic rubber polymeric compound preformed pipe sleeves. The pipe shall be thoroughly cleaned and applied with proprietary glue and then the pre-slit insulation pipe section shall slipped on the pipe. The slits should be sealed properly with proprietary adhesive tapes as per the direction of the manufacturer.

All exposed hot water pipework in ducts, cavities, above false ceiling etc. should be insulated with 9 mm thick with extended synthetic rubber polymeric compound performed pipe sleeves.

5.6 VALVES, TAPS AND MIXERS

(1) General

Each valve body shall be marked with cast or stamped lettering giving the following informations:

- a) The manufacturer's name or trade mark
- b) The size of the valve
- c) The guaranteed working pressure

Isolating valves on the water supply lines shall be full bore ball valve type for pipe diameters upto 50 mm. For 65 mm dia and 80 mm dia., these shall be gate valve type and diameters above 80 mm, these shall be sluice valve type.

(2) Float Valve

Float valves 50 mm and smaller shall be of brass, gun metal or other equally suitable corrosion resistant alloy in accordance with IS:1703-1977 or approved equal. The float valves shall have copper or plastic floats suitably reinforced to hold the threaded insert. The float valves fixed to the system shall be secured with backnuts.

(3) Fullway Gate Valve

The valves shall be of quality approved by the Consultant/Engineer-in-Charge and shall generally conform to IS:778-1971.

(4) Full Way Ball Valve

The valves shall be of full bore type and of quality approved by the Consultant/Engineer-in-Charge. The body and ball shall be of copper alloy and stem seat shall be of teflon.

(5) Non-Return Valves

Non-return valves are to be IS:778-1984 manufactured from gun-metal or dezincification resistant brass.

(6) Pressure Reducing Valve

The valve shall be suitable for water application and shall conform to relevant BIS standard. The valve should be installed in a vertical portion on horizontal line. In all cases, a stop valve should be installed in an easily accessible position on the inlet side of the pressure reducing valve. A safety valve and a pressure gauge must always be installed on the reduced pressure or outlet side of the pressure reducing valve. To avoid any dirt from entering the valve, it is advisable to fit a strainer on the inlet or high pressure line. The pressure reducing valve and accessories should conform to relevant BIS standard and of approved make.

(7) Butterfly Valves

The valve shall be of cast iron conforming to relevant IS:13095. The valve shall be of quality approved by the consultant/Engineer-in-charge.

(8) Taps and Mixers

Bib or mixer taps shall be fixed to sinks, lavatory basins, bathtubs and showers and as shown on the drawings and/or specified under the Sanitaryware schedule.

The Contractor must ensure that the installed taps and mixers are not damaged or mishandled till the handing over of the installation.

6.0 SANITARY FIXTURES AND FITTINGS

6.1 WORKMANSHIP

All Sanitaryware shall be fixed in neat workmanship like manner, true to level and plumb. Manufacturer's instructions shall be followed closely regarding installation and commissioning.

6.2 SANITARYWARE

All fittings provided by the Contractor shall be of first quality, free from wraps, cracks and glazing defects. All sanitaryware, fittings and fixtures shall be fitted as shown in drawings and as described in details in Bill of Quantities.

6.3 FIXING

All sanitarywares shall be installed in accordance with manufacturers printed instructions for conditions indicated and as required to obtain a rigid installation. The location of each fixture and the fixing method of ceramic fixtures shall be as shown on the drawings or as directed by the Engineer-in-Charge.

After all fittings have been mounted and are ready for use and before completion, all fittings furnished and mounted shall be thoroughly cleaned removing all plaster, stickers, rust, hair and other foreign matter or discolouration of fixtures, leaving each and every part in perfect condition and ready for use.

6.4 PROTECTION

The Contractor shall take adequate precautions to ensure that the sanitarywares are not damaged in any way before or after installation. Any piece of sanitaryware that is damaged shall be replaced at the Contractor's expense. The Contractor shall be responsible for checking sanitaryware on arrival at site. If any pieces of sanitarywares are found to be damaged on arrival at site, the Contractor shall inform the Engineer-in-Charge within two days. If the sanitarywares are delivered in damaged state, the Contractor shall refuse delivery of the damaged piece and shall request a replacement of the same.

6.5 TESTING

Just prior to handing over the building to the Owner, each piece of sanitaryware shall be tested. Each water closet shall be flushed twice and checked for leaks and any other defects by the Engineer-in-Charge.

Each basin, bidet, bath and sink shall be filled to the overflow level and then after running the water through the overflow for a minimum of 30 seconds, the plug shall be removed or opened. Each of the above mentioned fixtures shall be inspected for leaks and defects by the Engineer-in-Charge.

Any defects or leaks shall be repaired or in the case of the defect being chips or cracks or other visible damage, the fixture shall be replaced at the Contractor's expense. Any sanitaryware condemned by the Engineer-in-Charge for any other reason shall be replaced at the Contractor's expense.

7.0 TESTING AND COMMISSIONING

7.1 GENERAL

7.2 The Contractor shall be responsible for testing and commissioning the entire services installation described in these specifications and will demonstrate the operation of the system of the entire Satisfaction of the Engineer in charge.

7.3 METHOD OF TESTING

The test on various services shall be carried out as described herein as described in relevant Indian Standards and British Standards and also as directed by the Engineer-in-Charge. The carrying out and recording of tests shall be agreed with the Engineer in charge.

7.4 WATER FOR TESTING

Water for testing shall be obtained by the Contractor from an approved source. It shall be free from bacterial contamination silt, grit, sand etc. After testing, the Contractor shall satisfactorily dispose off all water, or it may be re used providing it is clean and is not contaminated.

7.5 TEST RECORDS

The Contractor shall be responsible for the keeping all records of tests and on completion shall provide records and reports of the tests in triplicate. All test records shall clearly identify the item of the test and must be signed by the Contractor's authorised representative and Engineer-in-Charge.

7.6 UNSATISFACTORY WORKS

If the tests reveal unsatisfactory materials, installation or adjustment, the Contractor shall, at his own expense, carry out such alternations or replacements as may be necessary to rectify the defective work. The Contractor shall then repeat the tests as necessary to establish the satisfactory nature of the alterations or replacements.

7.7 TESTING AT WORKS

All plants and equipments shall be tested at manufacturer's works before dispatch and the test certificate in duplicate shall be forward to Engineer-in-Charge.

The Contractor shall similarly provide a set of manufacturer's certified test curves for any pump installed under the Contract. All tests shall be in accordance with the appropriate Indian Standards and British Standards as applicable.

7.8 ON SITE TESTING

The Contractor shall provide onsite all the necessary instruments, plant, equipment, materials, water, electricity and labour necessary for carrying out the specified tests. All tests shall be carried out as required to meet the construction programme and the Contractor

shall include for all necessary isolation and other works as may be required for testing the whole or parts of the installation. The Contractor shall also be responsible for re-testing, if necessary, until satisfactory tests are achieved.

7.9 TEST PRESSURES

Pipe Line	Test Pressure	Period	Method
Water Mains, Fire Mains & Water Services.	5 kg/sq.cm. or maximum working pressure plus 50 percent whichever is greater.	2 Hours	Hydraulic Pressure Test
Underground Drainage	1.5 metre head of water at highest point	30 min.	Hydraulic Test
Foul Drainage above ground	i) Not more than 4.5 M head in any section	2 Hours	Hydraulic Test
	ii) 75 mm water gauge	3 min.	Air Test

7.10 TESTING OF VARIOUS SERVICES

(1) Water Services

Before the pipes for water supply are painted or covered they shall be tested to a hydraulic pressure of 5 kg/sq.cm or maximum working pressure plus 50 percent whichever is greater. Pressure shall be maintained for atleast 2 hours without appreciable drop in pressure. In addition to the sectional testing of water supply pipes, the Contractor shall test the entire installation on completion of the job to the entire satisfaction of the Engineer-in-Charge. The Contractor shall rectify all leakages and restore damage done to the building and furniture at his own cost.

(2) Underground Drainage

The sewer and drain lines shall be tested for water tightness and straghtness as described below

i) Water Test:

Pipes and joints shall be subjected to a test pressure of at least 1.5 m head of water at the highest point of the section under test. The test shall be carried out by suitably plugging the low end of the drain and filling the system with water. A knuckle bend shall be temporarily jointed in at the top end and a sufficient length of vertical pipe jointed to it so as to provide the required head. Or top end may be plugged with a connection to a hose ending in a funnel which could be raised or lowered till the required head is obtained and fixed suitably for observation.

ii) Test for Straightness and Observation.

Sewer lines shall be tested for straightness :

- a) By inserting at the high end of the sewer or drain a smooth ball of diameter 13 mm less than the pipe bore. In the absence of obstruction, such as yam or mortar projecting through the joints, the ball should roll down the invert of the pipe and emerge at the lower end; and
- b) By means of a mirror at one end of the line and lamp at the other. If the pipe line is straight, the full circle of light can be observed. If the pipeline is not straight, this will be apparent. The mirror will also indicate obstruction in the barrel.

(3) Above Ground Foul Drainage

All soil, waste and vent pipes shall be tested by filling up the whole or part of stack with water. All openings for connections, etc. shall be suitably plugged. The total head shall however not exceed 4.5 metres.

Contractor shall remove and replace all pipes having holes, cracks etc. All leaking joints and access doors shall be replaced or remade to the entire satisfaction of the consultant. Water shall be retained in stack for a minimum period of 2 hours. After all plumbing fixtures are installed. Contractors shall apply the smoke test to the entire stack to the satisfaction of the Consultant.

(4) Sanitary Fixtures & Fittings

When the installation has been complete to the satisfaction of the Consultant, it shall be tested in the following manner :

- i) The entire system shall be slowly filled with water, allowing any trapped air to escape.
- ii) When all outlets are closed, the system shall be checked for water tightness.

Each outlet shall then be checked for rate of flow and correct operation.

- i) Waste outlets of wash basins and sinks shall be plugged and the basin and sink bowls shall be filled upto over flow level. Plug shall be removed and waste pipe

and trap shall be checked for leakage and floor drain (if fixture waste is connected to floor drain) shall be checked for overflow.

(5) Testing Manholes

All open channel manholes shall be tested with water to a height of 1.0 metre above the channel invert or as otherwise directed. The water level shall be retained for a 2 hour period without appreciable loss. When the water is released the benching shall be inspected to ensure that there are no cracks.

7.11 FLUSHING OUT AND STERILISATION OF PIPEWORK AND TANKS

It is essential that all internal water services, external mains and tanks are thoroughly flushed out prior to being put into service and that drinking and domestic water services mains and tanks are sterilised in accordance with clause 13 of IS : 2065-1983 – Code of Practice for Water Supply in Buildings. The Contractor shall be responsible for making any temporary pipe work connections required.

Following completion of sterilisation of every part of the drinking and domestic water system, the Contractor is to ensure that satisfactory bacteriological samples are obtained and tested at an approved laboratory and the result approved by the Architect/Consultant prior to completion of the contract and handing over to the Owner.

8.0 OPENING AND CLOSING OF CUTOUTS:

The contractor shall utilise specified cutouts and sleeves provided during the construction to prevent the breakage. The annular space in between the pipes and sleeves shall be filled and tighten by using the approved and guaranteed fire retarded sealant. In case of sleeves or cutouts are misplaced or not located then the contractor will make the provision for cutouts or sleeves in walls, columns, slab etc at his own cost, with prior permission of the project manager. Nothing extra shall be paid to the contractor on this account for making and sealing the cutouts and sleeves.

No cutout or sleeves shall be provided in walls, slabs, terraces after completion of water proofing or finishing works only on the approval of the project manager such cutouts or sleeves may be provided, and the work will be finished by the contractor with necessary water proofing membrane as directed by the project manager at his risk and cost.

9.0 CLAMPS, SUPORTS AND FASTENERS:

In all types of work all supports, hangers and clamps to be fixed on RCC beam, walls, columns, slab, boundary wall and piers by means of approved galvanized expandable anchor fasteners in drilled hole of correct size and should be sufficiently strong to carry the load of pipes etc. Drilling should be done by approved power drill as recommended and approved by the manufacturers of anchor fasteners. Failure of any fastening device shall be the entire responsibilities of the contractor and he will replace such defective fasteners at his own cost. Project manager in the interest of work may use such clamps, fasteners, hangers etc for other services also.

The project manager may modify the design and utilization of clamps, hangers, supports, fasteners contractor is not entitled to refuse such modification, only extra cost incurred will be compensated by the project manager on his discretion.

To facilitate the C P fittings etc, the making of hole or cutouts and making good the same should be in engineering manners if any tiles, stone slabs etc are damaged then contractor will replace the same in nice manner at his own cost, Only trap cutting at the drain point, floor trap points are exclusive from the scope of the contractor.

(D) FIRE FIGHTING INSTALLATIONS

1 SCOPE OF WORK

This contract shall include the following services :

- a) Installation of External and Internal Hydrant System and First Aid Hose Reels.
- b) Installation of Automatic Sprinkler System in basements and on all floors
- c) Installation of Portable Fire Extinguishers.
- d) Installation of Fire Fighting Pumping system and associated pipe work
- e) Identification and labeling of the pipe work and equipment under the scope of this contract.

2 STATUTORY APPROVALS

Fire Fighting Installation shall be in conformity with the regulations of local Fire Department. The Contractor shall be responsible for obtaining the approval of the Local Fire Department for the installation done under the scope of work. The work will not be considered as complete unless the N.O.C. from District Fire Officer is provided.

2.4.3 Operating and Maintenance Manual, Test Certificate etc

- i) The Contractor shall furnish six copies in bound form of an instruction manual and test certificates containing all information applicable to this section of the Works. This manual is to be similar in design and content to those to be provided under other services. The manual shall contain a comprehensive written description of the Works, outlining the operation of the systems and maintenance procedures.

2.4.4 "As built " Drawings

- i) On completion of the Works the Contractor shall supply three clear coloured prints of each applicable drawing, showing the exact position of all apparatus, pipe lines, services, control valves, switchgear etc. The word "AS INSTALLED DRAWINGS" shall be clearly indicated on all drawings adjacent to the title block.

3 PIPE WORK

3.1 MATERIALS

The pipe work shall be done in black mild steel pipes of 'Heavy' grade conforming to IS:1239 (Part I)-1990 for upto 150 mm dia pipe and IS:3589-1991 for pipes above 150 mm dia.

Fittings: All fittings upto 50 mm dia shall be black forged steel pipe fittings with threaded ends/ weldable socketed ends. Fittings above 50 mm dia shall be heavy duty mild steel with weldable ends. All fittings shall be conforming to relevant Indian Standards and shall have manufacturer's trade mark stamped on it. Fittings in M.S. pipe lines shall include elbows, tees, bends, reducers, nipples, union

For welded joints forged steel fittings of approved type with "V" groove shall be used.

All fittings shall be tested at manufacturer's work. The Contractor may be required to produce certificate to this effect from the manufacturers.

3.2 JOINTING

The pipes and fittings upto 50 mm diameter shall be threaded joints using Teflon Tape on the threads or welded joints as per the site requirements with prior approvals from Project Manager. Joints for pipe and fittings above 50 mm diameter shall be welded joints. Care shall be taken to remove any burr from the end of the pipe after cutting..

3.2.1 Welded Joints

General

The welding of pipes in the field should comply with IS:816, 1969. Electrodes used for welding should comply with IS:814, 1991.

Joints between M.S. pipes and fittings shall be made with pipes and fittings having “V” groove and welded with electrical resistance welding in an approved manner Butt welded joints shall not be acceptable. Care shall be taken to remove any burr from the end of the pipe after cutting.

All welders must be fully qualified and proof of an operator’s qualification shall be either the Contractor’s record of suitable tests passed within the previous six months or tests made before the commencement of the work. The Contractor must submit to the Engineer-In-charge the names of the welders who will be employed on the work, together with documentary evidence of their competency.

Any welder considered by the Engineer-In-charge as not having the skill necessary for the work will at once be barred from further welding on the site or in the Contractor’s workshop.

The Engineer-In-charge may instruct the Contractor to cut out typical welded joints for inspection and the Contractor shall include for the removal of such pieces and re-making joints to the satisfaction of the Engineer-In-charge. The Contractor shall include in his Tender for the cost of removing all such pieces for inspection and re-making joints.

Care must be exercised by the Contractor to ensure that the welding flux does not project into the bore of the tube. All welds shall be good, clean metal, free from slag inclusions and porosity, of even thickness and regular contour, well fused with the parent metal and finished smooth.

Where site welding is carried out in proximity to inflammable materials, the Contractor must take special precautions to protect the materials from risks of fire.

Testing of Welded Joints

The welded joints shall be tested in accordance with procedure laid down in IS:3600 (Part I) : 1985. One test specimen taken from at least one field joint out of any 10 shall be subjected to test.

If the results of the tensile test do not conform to the requirements specified, retests of two additional specimen from the same section shall be made, each of which shall conform to the required specifications. In case of failure of one or two, extensive gouging (scooping out) and repairing shall be carried out as directed by the authority.

If internal pressures exceed 1.5 MPa (15 kgf/cm²), special attention should be given to the assembly of the pipe and the first run of weld. Non-destructive testing of the completed weld may be carried out on pipe-lines by radiographic (see IS:4853 : 1982) or ultrasonic method (see IS:4260, 1986)) as agreed upon between the Engineer-In-charge and the Contractor.

3.2.2 Screwed Joints

Joint for black steel pipes and fittings shall be metal to metal threaded joints using Teflon tape on the threads.

3.2.3 Flanged Joint

M. S. Flanges shall be as per IS: 6392 and shall be faced. Rubber or asbestos gasket shall be inserted between the joints.

Flange shall be provided for jointing all type of valve, appurtenances, pumps, connection with other type of pipes, to water tanks and other places necessary and required as per good for engineering practice.

Flanged joints shall be avoided on straight runs as far as possible.

3.2.4 Unions

Provide approved type of dismountable unions on pipes lines 50 mm and below in similar places as specified for flanges.

3.3 LAYING AND FIXING

a) Above Ground :

Exposed pipes on walls and ceilings shall be fixed with standard pattern G.I. holder bat clamps on angle iron frames embedded in walls or suspended from ceiling. The clamps shall be spaced at regular intervals in straight lengths as per the following table :-

Dia of Pipe (MM)	Horizontal Length (M)	Vertical Length (M)
25	2.4	3.0
32	2.7	3.0
40	3.0	3.6
50	3.0	3.6
65	3.6	4.5
80	3.6	4.5
100	4.0	4.5
150	4.5	5.4

Additional supports are to be provided at every change of directions and branch-offs

b) Under Ground:

The trenches for the underground mains shall be 75 cm wide at top and excavated to a depth so that a minimum 1 meter of cover above the crown of the pipe is available after backfilling.

The pipes shall be evenly laid in the trenches after coating and wrapping as described hereinafter and covered with fine sand 150 mm all around. Any damage to coating and wrapping shall be made good before backfilling.

c) **Protection of Underground Pipes:**

The underground steel pipes shall be protected by coating and wrapping. The coating and wrapping shall be done, in general, as per IS:10221 – 1982 using Coal Tar Based Anticorrosion Tape conforming to IS: 15337 -- 2003 .

If specified in Bill of Quantities, the proprietary pipe protection system shall be provided as per the Manufacturers recommendation. The proprietary system shall be of approved make.

d) Anchor Blocks

Suitably designed anchor blocks in cement concrete to encounter excess thrust due to water hammer and high pressure should be provided at all bends, tees and such other locations as directed by the Engineer-In-charge. Exact location, design, size and mix of the concrete block shall be approved by the Engineer-In-charge prior to the execution of the work.

3.4 PAINTING AND FINISH

All pipe work and supports should be thoroughly cleaned applied with a coat of primer and minimum two coats of enamel paint of approved shade. The paint shall have a minimum two hours fire rating.

4. VALVES & OTHER ACCESSORIES

4.1 GENERAL

Each valve body shall be marked with cast or stamped lettering giving the following information.

- d) The manufacturer's name or trade mark
- e) The size of the valve
- f) The guaranteed working pressure

Isolating valves on the water supply lines shall be full bore ball valve type for pipe diameters upto 50 mm. For 65 mm dia and above these shall be butterfly valves.

4.1.1 Full Way Ball Valve

The valves shall be of full bore type and of quality approved by the Engineer-In-charge. The body shall be hot pressed brass nickel plated. The ball shall be of brass, hard chromium plated, machined to a micro smooth finish. Handle shall be of hard aluminium alloy epoxy painted. Stem seat shall be of PTFE. The valve shall conform to EN 29000- ISO 9000.

4.1.2 Butterfly Valves

The valve shall of cast iron conforming to relevant IS:13095. The valve shall be of quality approved by the Engineer-In-charge.

4.1.3 Non-Return Valves

Non-return valves are to be IS:778-1984 manufactured from gun-metal or dezincification resistant brass.

4.1.4 Fullway Gate Valve / C.I.Sluice Valve

The Fullway Gate Valve shall be of quality approved by the Engineer-In-charge and shall generally conform to IS:778-1971.

The C.I.Sluice Valve of size 50 mm dia and above shall conform to IS:14846 .

4.1.5 Air Release Valve

Air Valves are to be provided on all high points in the system. These shall be 25 mm dia screwed inlet forged brass/cast iron single acting air valves connected with ball valve on inlet side.

4.1.6 Drain Valve

Drain Valves are to be provided at all low points in the system for draining the water. These shall be 40 mm dia full way ball valve fixed on 40 mm dia black steel pipe.

4.1.7 Flow Switch

Flow switch shall be provided on sectional mains and branch lines of sprinkler systems as indicated on drawings, or necessary and required and directed by the Engineer-In-

charge. Flow switch should be suitable to actuate at a minimum of flow of single sprinkler and shall be suitable for connection to a central annunciation panel.

4.2 PRESSURE SWITCHES

Pressure Switches shall be differential type for operation of all pumps and for the various duties and settings required. Pressure switches shall be for heavy duty operation and of approved make. All pressure switches shall be factory calibrated.

5. FIRE FIGHTING APPARATUS & FITTINGS

5.1 EXTERNAL YARD HYDRANT

- i. The external hydrants shall be controlled by a cast iron butterfly valve. Hydrants shall have instantaneous type 63mm dia outlets. The hydrants shall be single outlet conforming to I.S:908-1975 with flanged riser of required height to bring the hydrant to correct level above ground.
- ii. Contractor shall provide for each external fire hydrant two numbers of 63 mm dia. 15 mm long rubberised fabric linen hose pipe with gunmetal male and female instantaneous type couplings machine wound with G.I. wire (hose to I.S.:636 Type A and couplings to I.S:903 with M.S. certification), gunmetal branch pipe with nozzle to I.S:903.

5.2 INTERNAL HYDRANTS (LANDING VALVES)

- i. The internal hydrant shall be single headed gunmetal landing valve conforming to I.S:5290-1993, with individual shut off valves and cast iron wheels. Landing valve shall have flanged inlet and instantaneous type outlets as shown on the drawings.
- ii. Instantaneous 63 mm dia outlet conforming to I.S:903 for fire hydrants shall be of standard pattern approved and suitable for fire brigade hoses.
- iii. Contractor shall provide for each internal fire hydrant station two numbers of 63 mm dia. 15 mm long rubberised fabric linen hose pipes with gunmetal male and female instantaneous type coupling machine wound with G.I. wire (hose to I.S:636 Type A and couplings to I.S:903 with I.S certification), fire hose reel, gunmetal branch pipe with nozzle I.S:903.

5.3. FIRST AID FIRE HOSE REEL

The First Aid Fire Hose Reels must be of type II and shall have 30 metre of 20 mm dia bore reinforced rubber hose fitted with shut-off gun metal nozzle. The hose reel shall be conforming to IS:884 - 1985.

5.4. FIRE HOSE CABINET

The Fire Hose Cabinet of sizes suitable to accommodate equipment as specified in bill of quantities shall be fabricated of 16 gauge CRCA M.S. sheet and powder Coated in fire red colour. Its door shall be hinged type having lock and reinforced glass panel.

The fire hose cabinet for yard hydrants shall be weatherproof type of size suitable to accommodate 2 nos. of 15M long 63mm diameter R.R.L. hoses with female & male gunmetal coupling and branch pipes.

Wherever masonry shaft is available to house equipment, only the glazed front panel is to be fixed as required and as specified in bill of quantities.

5.5 SPRINKLER HEADS

Sprinkler heads shall be of gunmetal and quartz bulb type with a temperature rating of 68 deg. Centigrade or as specified in the bill of quantities. These shall be of type and quality approved by the local fire service and TAC.

5.6 INSTALLATION VALVE FOR SPRINKLER SYSTEM

- a) Installation valves shall be installed in the pump room.
- b) Installation valve shall comprise of a cast iron sluice valve with gunmetal trim, pressure gauge, double seated clapper check valves as alarm valve with pressure gauge, test valve and orifice Assembly and drain pipe with pressure gauge, bye pass on check valve to regulate differential pressure and false alarm, turbine water gong including all accessories necessary and required and as supplied by original equipment manufacturer and required for full and satisfactory performance of the system.
- c) Contractor shall submit his detailed shop drawings showing the exact location, details of installation of the valves and alarms.

5.7 SPRINKLER ANNUNCIATION PANEL

Supply and installation of Sprinkler Annunciation Panel is not in the scope of this contract. The control cables from the flow switches are to be terminated in the Automatic Fire Alarm System Control & Indicating Panel, the supply of which is in the scope other contract. However, the Contractor would responsible for coordinating with the other agency for connecting, testing and commissioning of the said panel.

5.8 PORTABLE FIRE EXTINGUISHERS

Portable Fire Extinguisher shall be of type and as mentioned in the schedule of quantities. All fire extinguishers must conform to the relevant Indian Standards and must bear the ISI Certification Mark. These shall be installed and maintained in accordance with IS:2190 - 1971.

6. PUMPING SYSTEM

The Pumping System shall consist of electric motor driven as well as diesel engine driven fire pumps of duty as specified in the schedule of quantities. The major items under this head shall be as follows:

6.1 PUMPS

All fire pumps shall meet the following duty requirements :

- (i) Pumps should deliver atleast 150% of the rated discharge at a head of 65% of the rated head
- (ii) The shut off head shall not exceed 120% of the rated level.

Pumps shall be centrifugal type driven by either an electric motor or a diesel engine. However, wherever specified in schedule of Quantities, the jockey pump may be vertical inline type of stainless steel construction.

The casing will be of the volute type designed to ensure correct velocity distribution manufactured in close grained cast iron and complete with air release cock, drain plug and delivery pressure gauge connection.

The impeller will be of the shrouded type manufactured in close grained gun metal/bronze and keyed to the shaft. It will have balancing holes to achieve hydraulic balance and reduce pressure in the stuffing box and prolong the packing life. The impellers shall be dynamically balanced Connecting shaft shall be stainless steel with bronze sleeve and grease lubricated bearings. Close grained gun metal impeller wear rings will be fitted on both sides of the impeller to preserve running clearances.

Pumps shall be connected to the drive by means of spacer type love joy couplings, which shall be individually balanced dynamically and statically. The coupling jointing the prime movers with the pump shall be provided with a sheet metal guard.

Pumps shall be provided with approved type of mechanical seals.

The pumps shall have ratings as mentioned in schedule of Quantities. The pump shall meet the requirements of the Tariff Advisory Committee.

A Diesel Engine driven fire pump shall be provided as a standby arrangement. In the event of power supply not being available or non starting of Electric Motor driven pumps after the preset time, the Diesel Engine driven pump should start operating. If the diesel pump does not start, the system should be locked out and the audio visual alarm should be initiated.

6.2 ELECTRIC MOTORS

Rating of the selected motor shall be equivalent to the motor required for a pump capable of 150% of the rated discharge.

Electrically driven pumps shall be provided with totally enclosed fan cooled induction motors or as specified in Bill of Materials. For fire pumps the motors should be rated not to draw starting current more than 3 times normal running current. Motors shall be wound for class B insulation and winding shall be vacuum impregnated with heat and moisture resistant varnish glass fiber insulated. Motors shall be suitable for 415 volts, 3 phase 50 cycles A/C supply and shall be designed for 38 deg C ambient temperature. Motors shall conform to I.S:325. Motors shall be capable of handling the required starting torque of the pumps.

Motors for fire pumps shall meet all requirements and specifications of the Tariff Advisory Committee.

6.3 DIESEL ENGINES

The diesel engine shall be water cooled type and capable of developing 150% more B.H.P at 1500 r.p.m. as required by the pump specified in the Bill of Quantities. The engine should be mounted along with the pump on suitable common robust MS channel on cast iron bed plate with vibration clamping arrangement with cushyfoot or similar mountings. Engine exhaust pipe is to be insulated with asbestos taping followed by painting with aluminium paint.

The fuel tank shall be of welded steel construction conforming to relevant IS standard and having storage capacity sufficient to allow the engine to run on full load for 6 hrs. including inter connecting fuel pipework fuel in the tank. The tank shall be mounted above the engine to provide or gravity feed. A hand operated pump connected to the fuel tank shall also be provided for transferring the fuel from the drum at floor level to the elevated storage tank.

Engine shall be direct injection type with low noise and exhaust emission levels. Noise level of the engine shall not exceed 105 DBA (free field sound pressure) at 3 metres distance.

The speed of the engine shall match the pump speed for direct drive.

The engine shall be self starting type upto 4 deg C and shall be provided with one 24 volts heavy duty DC battery, starter, cut-out, battery leads complete in all respects.

The engine shall be provided with an oil bath or dry type air cleaner as per manufacturer's design.

Engine shall be suitable for running on high speed diesel oil.

The entire system shall be mounted on a common structural base plate with anti-vibration mountings and flexible connections on the suction and delivery piping.

6.4 OPERATING SEQUENCE OF FIRE PUMPS

Fire pumps shall operate on drop of operating pressure in the fire mains in the following sequence:

- a) The operating pressure in the mains is to be maintained at 7.5 kg/cm².
- b) The jockey pump shall start automatically the moment pressure drops to 6.5 kg/cm² and stop when the pressure reaches 7.5 kg/cm² again.
- c) In case, after the start of jockey pump, the pressure still keeps on falling, the main fire pump shall start at 8.0 kg/cm². Jockey pump shall stop when main pump starts.
- d) In the event of electrical or mechanical failure of main fire pump to start, the diesel engine driven pump shall cut in when the pressure in the mains fall down to 5.0 kg/cm².

- e) Both main fire pump and engine driven pumps should be stopped manually by starter push buttons only.
- f) Main Fire and Sprinkler pumps shall start independently and automatically on fall of pressure but stopping of the pump shall be shall be by manual push button from the MCC panel.

6.5 AUDIO VISUAL ALARM

An electrically operated fire alarm system shall be provided which is connected to the fire & sprinkler pumps to indicate their operation visually by a blinker lamp and by an approved type of audible alarm.

7. PUMP CONTROL PANEL

7.1 GENERAL

The Control Panel for firefighting system shall be housed in wall / floor mounted, dust and damp proof sheet steel cabinet with hinged front access door and shall have the suitable rating star-delta starters, timers, relays, necessary selector switch, for automatic and manual operation, indicating lamps, to show the status of each pump, single phase preventers, dry suction cut off, etc. and all other switch gear necessary for the satisfactory functioning of the hydrant system & sprinkler system.

Control Panels are to be suitable for 3 phase 4 wire 415 Volts 50 Hz system with a fault level of 31MVA at 415 volts.

Panel are to be metal clad, cubicle type totally enclosed, floor mounted and air insulated. The total height of the switchboard is to be not more than 2100 mm. Panels are to be extensible on both sides and shall conform to IP - 54 as per IS :2147

7.2 STANDARDS

The equipment shall be designed to conform to the requirements of :

- i) IS : 8623 - Factory built assemblies of switchgear and control gear.
- ii) IS : 13497 - General requirements for switchgear and control gear for voltages not exceeding 1000 Volts.
- iii) IS : 13947 - Degrees of protection provided by enclosures for low voltage switchgear and control gear.
- iv) IS : 375 - Marking and arrangement of bus bars.

Individual equipment housed in control panel shall conform to following IS specifications.

- | | | | |
|------|---------------------------------|---|------------|
| i) | Fuse Switch & Switch Fuse Units | - | IS : 13947 |
| ii) | H.R.C. Fuse links | - | IS : 9224 |
| iii) | Current Transformers | - | IS : 2705 |
| iv) | Voltage Transformers | - | IS : 3156 |
| v) | Relays | - | IS : 3231 |
| vi) | Indicating Instruments | - | IS : 1248 |
| vii) | Integrating Instruments | - | IS : 722 |

viii) Control Switches & Push Buttons	-	IS : 6875
ix) Contactors	-	IS : 13947
x) MCCB	-	IS : 13947

7.3 CONSTRUCTION DETAILS

Cubicle shall be mounted on a base folded channel of thickness 3 mm. All doors, side walls and interior separations shall be of CRCA MS sheet of thickness 2 mm. Insulation barriers and protective screens shall be provided wherever required.

Apparatus forming part of the control panel shall have the following minimum clearances:

i) Between phases	-	25 mm.
ii) Between phases and neutral	-	25 mm.
iii) Between phases and earth	-	25 mm.
iv) Between neutral and earth	-	19 mm.

Creepage distances shall comply to those specified in relevant standards.

7.4 MOULDED CASE CIRCUIT BREAKERS

MCCB shall conform to IS - 13947 and be rated for the currents as shown on the single line diagram. They shall have a short circuit rating as specified elsewhere.

All MCCB shall be provided with an adjustable thermal overload trip device together with an adjustable magnetic short circuit release. The MCCB shall have a trip free toggle mechanism, and dolly shall come to midway position and the trip operates.

The operating mechanism shall be quick make and quick break and trip free and contacts shall be single break type with arcing contacts located within arc chutes.

The MCCB shall be suitable for both vertical and horizontal mounting.

7.5 SWITCH FUSE UNITS / FUSE SWITCH UNITS

Fuse switch units shall be of the load break heavy duty type suitable for cubicle mounting with front operation. The switches shall conform to the requirements of IS : 13947 and shall be suitable for being fitted with HRC fuse links conforming to IS : 13703. The operating handles shall be interlocked with the opening of the door. The switches shall however be provided with a defeat interlock.

7.6 CURRENT TRANSFORMERS

Current transformers shall be of the ring type suitably fixed between insulating pieces and clamped. They shall conform to the requirement of IS : 2705 and shall have current ratio and outputs and accessories as specified.

7.7 INSTRUMENTS

Indicating instruments shall be flush mounting type square of required size and conforming to the requirement of IS : 1248.

7.8 BUS BARS

The bus bar shall be of Aluminium strip designed for a continuous current of specified rating and fabricated from bars conforming to grade E - 91 of IS : 5082. Each bar shall be provided with flexible expansion links as approved.

The bars shall be suitably supported with fiber glass reinforced epoxy supports to withstand the short circuit forces possible.

7.9 CONTROL WIRING

- i) All control wiring shall be carried out with 1100 / 660V grade single core PVC cable conforming to IS : 694 having stranded copper conductors of minimum 1.5 sq.mm. section for potential circuits and 2.5 sq.mm. section for current transformer circuits.
- ii) Wiring shall be neatly bunched, adequately supported and properly routed to allow for easy access and maintenance.
- iii) Wires shall be identified by numbered ferrules at each end. The ferrules shall be of the ring type and of non-deteriorating material. They shall be firmly located on each wire so as to prevent free movement.
- iv) All control circuit fuses shall be mounted in front of the panel and shall be easily accessible.

7.10 LABELS

Labels shall be of anodized aluminium, with white engraving on black background. They shall be properly secured with fasteners.

7.11 TESTS

The design of the control panel shall have been type-tested in accordance with following sections of CI.8 : 1:1 of IS : 8623 :

- a) Verification of temperature rise limits.
- b) Verification of dielectric properties.
- c) Verification of short circuit strength.

Routine tests shall be conducted on control panel in accordance with CI. 8 : 1 : 2 of IS : 8623 and shall comprise :

- i) Inspection of the panel including inspection of wiring and electrical operational tests where necessary.
- ii) Dielectric tests.
- iii) Checking of Protective Measures and electrical continuity of the protective circuits.

7.12 METAL TREATMENT AND FINISH

All steelwork used in the construction of the switchboards should have undergone a rigorous metal treatment process as follows :

- i) Effective cleaning by hot alkaline degreasing solution followed by cold water rinsing to remove traces of alkaline solution.
- ii) Pickling in dilute sulphuric acid to remove oxide scales and rust formation, if any, followed by cold water rinsing to remove traces of acidic solution.
- iii) A recognised phosphating process to facilitate durable coating of the paint on the metal surfaces and also to prevent the spread of rusting in the event of the paint film being mechanically damaged. This again, shall be followed by hot water rinsing to remove traces of phosphate solution.
- iv) Passivating in de-oxalite solution to retain and augment the effects of phosphating.
- v) Drying with compressed air in a dust-free atmosphere.
- vi) Two coats of stoving synthetic enamel epoxy paint to the specified shade of IS : 5. The total thickness of paint should not be less than 25 microns.

7.13 FIRE PANEL DRAWINGS

The contractor shall furnish the G.A. and control circuit wiring diagram drawings for approval

Detailed catalogues for all bought out equipment shall be made available for scrutiny and approval.

After completion of all works 3 sets of all final approved drawings covering G. A. Circuit diagrams, Single line diagrams for total system are to be made available

8 TESTING AND COMMISSIONING

8.1 GENERAL

The Contractor shall be responsible for testing and commissioning the entire services installation described in these specifications and will demonstrate the operation of the system to the entire satisfaction of the Engineer-in-charge.

Work under this section shall be executed without any additional cost. The rates quoted in this tender shall be inclusive of the works given in this section.

Contractor shall provide all tools, equipment, digital metering and testing devices required for the purposes.

The entire fire fighting piping system shall be tested at minimum 14 kg/cm² pressure. The test pressure shall be maintained for at least 2 hrs.

8.2 METHOD OF TESTING

The test on fire fighting installation shall be carried out as per the provisions of various Codes of Practice, fire protection manual of Tariff Advisory Committee and National Building Code.

The carrying out and recording of tests shall be agreed with the Engineer-in-charge. The following method of testing of hydrant and sprinkler installation shall be followed in general :

Fire Hydrant System

- i. Pressurise the fire hydrant installation by running the main fire pump and once the required pressure is achieved, switch off the pump.
- ii. Open bypass valve and allow the pressure to drop in the system. Check that the jockey pump cuts-in and cuts out at the pre-set pressures. If necessary adjust the pressure switch for the jockey pump. Close by-pass valve.
- iii. Open hydrant valve and allow the water to flow into the fire water tank in order to avoid wastage of water. The main fire pump should cut-in at the pre-set pressure and should not cutout automatically on reaching the normal line pressure. The main fire pump should stop only by manual push button. However the jockey pump should cut-out as soon as the main pump starts.
- iv. Switch off the main fire pump and test check the diesel engine driven pump in the same manner as the electrically driven pump.
- v. When the fire pumps have been checked for satisfactory working on automatic controls, open fire hydrant valves simultaneously and allow the hose pipes to discharge water into the fire tank to avoid wastage. The electrically driven pump should run continuously for eight hours so that its performance can be checked.
- vi. Diesel engine driven pump should also be checked in the same manner as given in para above by running for eight hours.

vii. Check each landing valve, male and female couplings and branch pipes for compatibility with each other. Any fitting which is found to be incompatible and does not fit into the other properly shall be replaced by the contractor. Landing valves shall also be checked by opening and closing under pressure.

8.3 WATER FOR TESTING

Water for testing shall be obtained by the Contractor from an approved source. It shall be free from bacterial contamination, silt, grit, sand etc. After testing, the Contractor shall satisfactorily dispose off all water, or it may be re used providing it is clean and is not contaminated.

8.4 TEST RECORDS

The Contractor shall be responsible for the keeping all records of tests and on completion shall provide records and reports of the tests in triplicate. All test records shall clearly identify the item of the test and must be signed by a witness to the test.

8.5 UNSATISFACTORY WORKS

If the tests reveal unsatisfactory materials, installation or adjustment, the Contractor shall, at his own expense, carry out such alternations or replacements as may be necessary to rectify the defective work. The Contractor shall then repeat the tests as necessary to establish the satisfactory nature of the alterations or replacements.

8.6 TESTING AT WORKS

All plants and equipments shall be tested at maker's works before despatch and the test certificate in duplicate shall be forward to Engineer-in-charge. The Contractor shall similarly provide a set of manufacturer's certified test curves for any pump installed under the Contract. All tests shall be in accordance with the appropriate Indian Standards.

8.7 ON SITE TESTING

The Contractor shall provide on site all the necessary instruments, plant, equipment, materials, water, electricity and labour necessary for carrying out the specified tests. All tests shall be carried out as required to meet the construction programme and the contractor shall include for all necessary isolation and other works as may be required for testing the whole or parts of the installation. The Contractor shall also be responsible for re-testing, if necessary, until satisfactory tests are achieved.

9 IDENTIFICATION OF PIPES LINES & EQUIPMENT

All pipeline installation shall be provided with a colour identification system. The system in general shall be as per IS:2379-1983-Specification of Colour Code for the Identification of Pipe Lines. The colour identification system shall comprise of :

- a) Basic Identification Colour over the whole length of pipe
- b) Code indication bands for precise determination of the contents being carried by the pipe

The code indication bands shall be minimum 150mm wide and shall be placed at all junctions, at both sides of valves, service appliances, bulk heads, wall penetrations and at any other place where identification is necessary. The colour of code indication bands shall be as directed by the Engineer-in-charge. The direction of flow shall be clearly marked on the pipe lines. The equipment shall be identified with identification plates as directed by the Engineer-in-charge.



13. List of approved make/material

(i) CIVIL WORK

S No	Material	Manufacturer
1	Cement (PPC-53 grade)	ACC, L & T, Ultratech, Shree Cement, Birla, Ambuja& CCI.
2	Steel Reinforcement Bars	RINL, TISCO, SAIL
3	Glass	Saint Gobin, Modi, Asahi
4	APP Water Proofing Treatment	Bitumat, Apex.
5	RMC	ACC, Ahlcon, L & T, Grasim.
6	Structural Steel Sections	TATA, SAIL, RINL
7	Structural M.S. Sections I & Channels	TATA, SAIL, RINL
8	MS Pipes	Kesoram, Electro Steel
9	Bitumen	Indian Oil, Hindustan Petroleum,
10	Water proofing compound	Tapcrete, CICO, Accoproof, Impermo
11	White Cement	J.K. White, Birla white
12	Admixture	Fosroc, MC, Sunanda Chemicals,
13	Damp proof material	Impermo, Duraseal, Acco proof
14	Ceramic tiles	Kajaria, Nitco, Somany, Johnson, Orient
15	Glazed tiles	Kajaria, Somany, Orient, NITCO & Johnson
18	Precast Cement Concrete covers/slabs	K.K., NITCO
19	Vitrified tiles	Kajaria RAK, Marbitto&Cengres
20	Board	Gypsum India, LA Gyp, Saint Gobin
21	Hanging system	Gypsum India, LA, Gyp.
22	Flush door shutters (Decorative / Non decorative)	Kitlam, National, Swasthic, Corbett, Kutty door.
23	Block Board & Ply Wood	Duro, National, Kitply
	Paints and related material	
26	POP	J.K. Laxmi, Andheri Sri Plaster Sriram
27	Exterior Putty	Birla Wall Care, Snocem India, JK Wall Care

28	Acrylic bound washable distemper	Bison Acrylic distemper of Berger, Nerolac premium washable of KNPL, Acrylic washable Tractor brand of Asian paints make. Maxilite of ICI paints.
29	Synthetic enamel paint	Luxol Hi-gloss of berger make, Full gloss hard drying Ultra white of KNPL, Apcolitelusture finish white of Asian Paints make, Dulux gloss of ICI make.
30	Cement Primer	B.P. (alkali resistant) water thinable of berger paint make, Primolite water thinable Goodlass Nerolac paint make, Cemprover of snowcem paint,
		Cement primer of Asian paint make.
31	Water proofing cement paint	Durocem of Berger paints make, Super snowcem decorative of snowcem India Ltd.
		Gattucem of Asian Paints, Farcocem of ICI paint
32	Acrylic Emulsion paint	Snowcryl XT of snowcem India Ltd.
		Apex Ultima of Asian paint
		Weather Coat Long Life of Berger Paints
		Duluxe Weather Shield of ICI Paints
32	Plastic emulsion paint	Luxolslik of berger paint, Velvet Touch of ICI, allscape of kansai Nerolac paint, Royal of Asian Paint make.
33	Aluminium Door & Window Fittings	Classic, Vishkarma, Argent
34	Fastners	Hilti, Fischer
35	Door fitting	B & R, Dorma
36	Nuts Bolt, Screws	Kundan, Priya&Atul.
37	Fire Check Door	Kutty Door/AGM Suraksha&Sukri.
38	Appoxy Mortar	Fosroc, Sika.
39	Wire Mesh	Sterling Enterpirses, TrimurtyWeldedmesh
40	Locks/Latch	Godrej, Harison, Plaza, Goldel, Yale
41	Poly-sulphidesealant	Pidilite, Tuffseal, Choksey, Chemicals
42	Panic Exit Device	Ingerroll Rand / Monarch
43	Door Coordinator	UL Listed / Monarch
44	Anodized Aluminium Hardware	Hardima, Everite, Sigma
45	Friction Stay Hinges	Earl-Bihari,Alkarma

(ii) Internal Electrical work

Sr. no.	Description	Approved Makes
A	Medium Voltage Switchgear	
1.	MCCB	L & T - D Sine /Schneider - Compact (CVS)/Siemens - 3 VL/GE - Spectra
2.	On Load Changeover Switch	L & T/ HPL - Socomec
3.	MCB's	Legrand / Hager / Schneider
B	Meters / Indicators	
1.	Ammeter/ Volt Meter (Digital type)	CONZERV / SECURE / AE
2.	Indicating Lamps (LED type)	Siemens/ L & T (Essbee)/ Schneider
3.	Push Buttons	Siemens/ L & T (Essbee)/ Schneider
C	Instrument Transformers	
1.	L.T. Current Transformers (CAST RESIN)	AEP/ Control & Switch Gear / Kappa / Gilbert &Maxwel
D	Cables	
1.	L.T. Cable	Gloster/ Skytone/ Rallison / KEI / Havells
E	Miscellaneous	
1.	Cable Gland	Comet/ Connect Wel/ Trinity Touch / Braco
2.	Lugs	Dowels/ Trinity Touch / Comet / Braco
3.	Selector Switch	Saizer / Kaycee
4.	Connectors	Connect Well/ Elemex/Trinity Touch
F	Lighting Fixture	Philips / Wipro/ Crompton
G	Fans	Crompton Greaves / GE- Alstom / Havells
H	Wiring Accessories	
1.	M.S Conduit (ISI marked)	BEC/AKG
2.	FRLS PVC Conduit (ISI marked)	BEC/ Polypack /AKG / ESC
3.	Wiring Cable, FRLS	Skytone / Polycab / Havells / Bonton / Rallison / ESC/ National
4.	Telephone Wiring Cable	Delton / Skytone / Polycab / National
5.	Data Cables	Awaya / AMP / Legrand Mosaic
6.	RJ -45 / RJ-11	Awaya / AMP / Legrand Mosaic
7.	Switches & Sockets	Anchor Roma Viola/ Legrand Mosaic Series /Clipsal Opale / Crabtree
8.	PVC Moulded Sockets	Legrand/ Schneider (Original) / Hager (L&T) / Bals.
9.	MCB/ DB'S (Factory Fabricated) (Original)	Legrand/Schneider/Hager (L&T)
10.	ELMCB/ ELCB (Original)	Legrand / Schneider / Hager (L&T)
I	Cable Tray / Raceway/ J Box	Venus / Mem/ Skaber / Globel - 9
J	Addressable Fire Alarm	Edward/ Honney Well (Esser) / Bosch
K	Maintenance Free Earthing	Alltec / Ashlok / Universal

(iii) Sanitary and plumbing

Sl. no.	Material	Brand name/manufacturer
A	Sanitary Fixtures and Faucets	
1.	Vitreous China Sanitaryware	a) Parryware b) Hindustan
2.	C.P. brass Faucets, Wastes, Traps etc	a) Jaquar b) Marc, c) Zim,
3.	C.P. Wastes, Spreaders, Flush Pipe	a) Lotus b) Orient c) ESS ESS
4.	W.C Pan Connector	a) Multikwik (UK) b) McAlpine (UK)
5.	C.P. Angle Valves (Ball Valve Type)	a) Jaquar b) Marc, c) Zim,
6.	Stainless Steel Sink	a) Jayna b) Neelkanth c) Salem
B	Pipes and Fittings (ISI Marked or Approved Quality)	
1.	Centrifugally Cast Iron Soil, Waste & Vent Pipes and Fittings	a) Jaiswal b) Neco
2.	G.I. Pipes	a) Tata b) Jindal (Hissar)
3.	G.I. Fittings	a) Unik Brand b) "R" Brand c) Zoloto
4.	CPVC Pipes and Fittings	a) Ajay b) Ashirvad c) Astral
5.	PVC Pipes (as per ASTM- D1785-SCH. 40) and Fittings (as per ASTM-D2467- SCH. 80)	a) Ajay b) Ashirvad c) Astral d) Supreme
6.	C.I. Class LA Pipes	a) Electro Steel b) Kesoram
7.	Stoneware Pipes, Gully traps	ISI marked of approved quality a) Bhaskar b) Anand
8.	R.C.C. Pipes	ISI marked of approved quality a) Pragati b) Laxmi c) Jain Spun Pipe

C	Insulation	
1.	Synthetic Polymeric Rubber Compound insulation	a) Vidoflex b) Superlon c) Kaiflex d) Aeroflex
D	Valves	
1.	Gunmetal Gate Valves, Non-return Valves, Float Valves	a) Leader b) Zoloto c) Sant
2.	Ball Valves	a) Zoloto b) TBS c) CIM, Italy d) Tiemme, Italy
3.	Pressure Reducing Valve	a) CIM, Italy b) R.B, Italy c) RBM, Italy d) OR, Italy
4.	Butterfly Valves	a) Audco b) KSB c) Advance d) SKS
E	Manhole Covers, Gratings etc.	
1.	Steel Fibre Re-inforced Concrete Manhole Covers and Gratings	a) K.K. Manholes b) Pragati Concrete c) NITCO
2.	C.I. Manhole Covers	a) RIF b) Kajeco c) Neco
G	Pumps and other Allied Equipments	
1.	Clear Water Pumps	a) Grundfos, Denmark b) DP, Holland, c) ITT, Lowara
2.	Electric Motor	a) Kirloskar b) ABB c) Crompton Greaves d) Bharat Bijlee
3.	Gunmetal Gate Valves, Non-return Valves, Isolation cocks for level gauges	a) Leader b) Zoloto c) Sant
4.	C.I Non-return Valves	a) Kirlosker b) IVC
5.	Dual Plate NRV	a) Advance b) Audco
6.	T/Y Strainer	a) Leader b) Zoloto

H	Electric Switch Gear and Starters	
1.	Electric Switch Gear	a) L & T b)ABB c) MDS, Legrand d)Siemens
2.	PVC Insulated Armoured Power andControl Cables	a)Nicco b)Asian RPG c) Universal
3.	Relay, contactor	a)L & T b) Siemens
4.	Meters, CT etc.	a)AE b)Rishab
5.	PLCs	a)Allen Bradley b)Grundfos c) Schneider Electric d)Modicon
6.	Pump Control Panel Manufacturers	a) Elegant Control b)Tricolite c)Adlec Systems d)Advance Control Pvt. Ltd.
7.	Cable tray	a)Steel Ways b)Bharti
G	Miscellaneous Items	
1.	Water Level Controllers (Magnetic Float Type)	a) Janus b) Elegant Control c)Swlitzer d)Techtron e)Hawk f)Interlink
2.	Anti-vibration Pads/Footings	a)Resistoflex b)Kanwal
3.	Vibrations Eliminators	a) Resistoflex b)Flexcons c)Arrowflex d)Kanwal
4.	Pressure Switches	a) System Sensor, U.S.A b)Danfoss c) Indfoss d)Swlitzer
5.	Flow Switches	a)System Sensor, U.S.A b) Viking
6.	Pressure Gauges	a)H. Guru b) Fiebig

7.	Expansion Bolts	a)Hilti b)Canon
8.	G.I. Hangers for Pipes / Adjustable Hanger	a) Chilly b) Camrey
9.	Welding Rods	a)Advani b)Victor c) Maruti
10.	Underground Pipe Protection Wrapping	a)IWL - Pypkote
11.	Expansion Bolts	a)Hilti b)Canon
12.	PVC Encapsulated Steel Foot Rest	a)KGM
13.	Fire Retarder sealant	a) Super Sera b) Fosrok

(iv) Fire Work

Sl. no.	Material	Brand Name/ Manufacturer
A	Pipes & Fittings (ISI Marked or Approved Quality)	
1.	Mild Steel Pipes	a) Tata b) Jindal (Hissar)
2.	Standard M.S. Fittings	a) VS Engineering b) True Forge c) Sant
3.	Forged Steel Fittings	a) VS Engineering b) JK Forging c) True Forge
B	Valves	
1.	C. I. Sluice Valves & Reflux Type Non-return Valves	a) Kirloskar b) I. V. C. c) Viking
2.	OS & Y Type C. I. Sluice Valves	a) Kirloskar b) Viking
3.	Butterfly Valves	a) Danfoss b) Audco c) Viking
4.	Butterfly Valves with temper switch	a) Viking b) Tyco
5.	Dual Plate Check Valves	a) Advance b) Audco c) KSB
6.	Wafer Type Check Valves	a) Danfoss b) EEE

7.	Ball Valves	a) Danfoss b) CIM, Italy c) RB, Italy
8.	Air Release Valves	a) Zoloto b) RBM, Italy c) Viking
C	Plant & Equipment	
1.	Fire Pumps	a) Kirloskar b) Mather Platt c) Grundfoss d) DP – Holland
2.	Electric Motor	a) Kirloskar b) Grundfoss c) Crompton Greaves d) DP-Holland
3.	Diesel Engines	a) Kirloskar b) Greaves c) Cummins
4.	MS Vessels	a) Custom Built as per b) Thebest Engineering c) Practices
D	Gun Metal Fire Fighting Fittings & Accessories	
1.	Gunmetal Landing Valve, Branch Pipe Nozzle, Fireman Axe, Fire Brigade Connection, Male-Female Couplings etc. (ISI Marked)	a) Minimax b) Newage c) Guards
E	Hose Pipes & First Aid Hose Reels	
1.	Fire Hose Pipe (R.R.L)	a) Eversafe b) Newage
2.	First Aid Hose Reel Drum & Bracket	a) Minimax b) Newage c) Eversafe
3.	Rubber Hose Reels	a) Tiger b) Kosmos c) Eversafe
F	Sprinkler Heads, Installations Valves & Deluge Valve	
1.	Quartzoid Bulb type Sprinkler Heads (UL Listed and FM Approved)	a) Viking b) Tyco
2.	Rosettes for sprinklers (UL Listed)	a) Viking b) Tyco
3.	Installation Control Valve Assembly with Hydraulic Gong (UL Listed and FM Approved)	a) HD Fire b) Newage c) Viking
4.	Fire Extinguishers	a) Minimax b) Ceasefire

G	Electric Switch Gear and Starters	
1.	Electric Switch Gear	a) L & T b) ABB c) Schneider d) Legrand
2.	PVC Insulated Armoured Power and Control Cables	a) Grandley b) Skytone c) Havell`s d) Polycab
3.	MCCB	a) L & T b) Merlin Gerin c) ABB
4.	MCB	a) L & T - Hager b) Merlin Gerin c) MDS –Lexic
5.	Relay, contactor	a) L & T b) ABB c) Siemens d) Schneider
6.	Meters, CT etc.	a) L & T b) AE c) Kappa
7.	Starters, Relays etc.	a) L & T b) ABB c) Control & Switch Gear d) GE – Power
8.	Push button and indication lights	a) L & T b) Siemens c) Telemenaque d) Vaishno e) BCH
9.	Digital Voltmeter & Ammeter	a) AE b) Cadel c) Enercon
10.	Selector Switches	a) L & T b) Keycell c) Salzar
11.	HRC Control Fuses	a) L & T b) Siemens

12.	PLCs	a) Allen Bradley b) ABB c) Siemens d) Schneider Electric e) Modicon
13.	Panel Manufacturers	a) Elegant Control System b) Advance Control Pvt Ltd c) Advance Panels and Switchgears Pvt. Ltd. d) Neptune e) DRK
14.	Cable tray	a) Pic b) Pilko c) Indiana d) Slotco
H	Miscellaneous	
1.	Flow Switches (UL Listed and FM Approved)	a) System Sensor, U.S.A b) Viking c) Spraysafe
2.	Expansion Bolts	a) Hilti b) Bosh
3.	G.I. Hangers for Pipes / Adjustable Hanger	a) Chilly b) GMGR
4.	Welding Rods	a) Advani b) Victor
5.	Pressure Gauges	a) H Guru b) Fiebig c) Wika
6.	Underground Pipe Protection Wrapping	a) IWL - Pypkote b)
7.	Pressure Switches	a) Danfoss b) Switzer
8.	Anti-vibration Pads/Footings	a) Polybend (Rathi) b) Resistoflex
9.	Vibrations Eliminators	a) Resistoflex b) Flexcons c) Arrowflex d) Kanwal
10.	Pump and Motor Couplings	a) Lovejoy(Rathi)

Contractor shall ensure that the above mentioned makes of material are available in the market and get the makes approved from the Engineer-in-charge.



ANNEXURES

ANNEXURE - I

NAME OF WORK: -Vertical Expansion of (C/o Upper Floors) IWAI office cum R & D complex at A-13, Sector-1,Noida. (SH: Civil,Sanitary Installations, Internal Electrical and Firefighting work, etc.)

TOTAL NO. OF TECHNICAL PERSONS WITH QUALIFICATION AND EXPERIENCE OF EACH

Sl. no.	Designation	Total no. available	Name(s) of key & expert persons who shall be assigned this job	Qualification	Professional experience & details of works carried out	How these would be involved in this work	Employed since	Remarks
1	2	3	4	5	6	7	8	9

ANNEXURE – II

PROFORMA FOR EXPERIENCE

DETAILS OF SIMILAR WORKS CARRIED OUT BY THE FIRM

(SEPARATE SHEETS TO BE ATTACHED)

S. No	NAME OF ORGANISTON	NAME OF WORK	CONTRACT VALUE	SCHEDULED DATE and ACTUAL DATE OF COMPLECTON (EXTN. OF TIME, IF ANY)	ACTUAL REASON FOR DELAY IN COMPLEETION, IF ANY

FORMAT OF BANK GUARANTEE FOR PERFORMANCE SECURITY

To
The Chairperson,
Inland Waterways Authority of India,
A-13, Sector-I,
NOIDA – 201 301.

WHEREAS..... (name and address of contractor) hereinafter called “the contractor” has undertaken, in pursuance of Contract No. Datedto execute..... (name of Contract and brief description of Works) (hereinafter called “the contract”).

AND WHEREAS it has been stipulated by you in the said contract that the Contractor shall furnish you with a Bank Guarantee by a Nationalised/Scheduled bank of India for the sum specified therein as performance guarantee for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee:

NOW THEREOF we hereby affirm that we are the guarantor and responsible to you on behalf of the Contractor, up to a total of Rs.....(amount of guarantee) (Rupees..... (in words), such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of (amount of guarantee) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the contract or of the works to be performed there under or of any of the contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until 28 days from the date of issue of the Defects Liability Certificate.

Signature and seal of the Guarantor.....

Name of the Bank

Address.....

Date.....

In the presence of

1.....

(Name of Occupation)

An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract and denominated in Indian Rupees.

PROFORMA FOR AGREEMENT
(TO BE SUBMITTED ON RS.100/- NON JUDICIAL STAMP PAPER)

CONTRACT AGREEMENT FOR THE WORK OF

Made this Day of.....

Between..... M/s

Hereinafter called the “Contractor” (which terms shall unless excluded by or repugnant to the context include its successors and permitted assigns) of the one part; and Inland Waterways Authority of India, A- 13, Sector- 1 Noida- 201301 (U.P.) hereinafter called the “OWNER” (which terms shall unless excluded by or repugnant to the context include its successors and permitted assigns) of the other part.

WHEREAS

- a) OWNER being desirous of getting executed the WORK mentioned, enumerated or referred to in the Bid Document including Notice Inviting Tender, Instruction to Bidders, General Condition of Contract, Special Conditions of Contract, Specifications, Time Schedule, Letter of Acceptance of Bid and other documents has invited Bids.
- b) CONTRACTOR has inspected SITE and surroundings of WORK specified in the Bid Documents and satisfied himself by careful examination before submitting his Bid as to the nature of the quantities, nature and magnitude of WORK, availability of equipment etc. necessary for the execution of WORK, the means of access to SITE, the position of supply of power and water thereto and the accommodation he may require and has made local and independent enquiries and obtained complete information as to the matters and things referred to, or implied in the Bid Document or having any connection therewith, and has considered the nature and extent of all probable and possible situation, delays, hindrances or interferences to or with the execution and completion of WORK, to be carried out under this CONTRACT, and has examined and considered all other matters condition and things and probably and possibly contingencies, and generally all matters incidental thereto and ancillary thereof effecting the execution and completion of WORK and which might have influenced him in making his Bid.
- c) The Invitation to Bid, instructions to Bidders, General Conditions of Contract, Description of Works and specifications, Plans, Time Schedule, Letter of Acceptance of Bid any and any other documents and enclosures, copies of which are hereto annexed are included in the expression “CONTRACT” :

AND WHEREAS

OWNER accepted the Bid of CONTRACTOR for the provision and the execution of WORK at the CONTRACT PRICE as indicated in the letter of award of work upon the terms and subject to the conditions of Contract.

Now this CONTRACT AGREEMENT witnesseth and it is hereby agreed and declared as follows:

1. In consideration of the payment to be made to CONTRACTOR for WORK to be executed by him, CONTRACTOR hereby covenants with OWNER that CONTRACTOR shall and will duly provide, execute and complete the work and things in CONTRACT, mentioned or described or which are to be implied therefrom or may be reasonably necessary for completion or stipulations mentioned in CONTRACT.
2. In consideration of the due provision, execution and completion of WORK by the CONTRACTOR in accordance with the terms of the CONTRACT, the Owner does hereby agree with CONTRACTOR that OWNER will pay to Contactor the respective amount for the work actually done by him and approved by Owner as per Payment Terms accepted in CONTRACT and payable to CONTRACTOR under provision of Contract; such payment to be made at such time and such manner as provided for in the CONTRACT.

AND

3. In consideration of the due provision, execution and completion of WORK, CONTRACTOR does hereby agree to pay such sums as may be due to OWNER for the services rendered by Owner to Contractor as set forth in CONTRACT and such other sums as may become payable to Owner towards loss, damage to the OWNER's equipment, materials etc. and such payments to be made at such time and in such manner as in provided in the CONTRACT.

IN WITNESS WHEREOF Parties executed these presents on the day and the year above written.

Signed and Delivered for
and on behalf of
CONTRACTOR

.....
.....

Date.....
Place

Signed and Delivered for
and on behalf of
OWNER (IWAI)

.....
.....

Date

Place

In presence of Witness (Signature with Name & Address)

1.
.....
2.
.....

1.
.....
2.
.....

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CONSTRUCTION OF VERTICAL EXPANSION
(UPPER FLOORS FROM 2nd TO 6th)
AT IWAI OFFICE CUM R & D COMPLEX AT
A-13, SECTOR-1, NOIDA

(SH:CIVIL, WATER SUPPLY & SANITARY INSTALLATION,
INTERNAL ELECTRICAL AND FIRE-FIGHTING WORKS, ETC.)

PART – II

PRICE BID