दूरभाष/ Telephone: 295147,295123
एसटीडी कोड/STD Code : 02525
फैक्स/Fax:02525-244201

सत्यमेव जयते
भारत सरकार
Government of India
भाभा परमाणु अनुसंधान केंद्र
BHABHA ATOMIC RESEARCH CENTRE
नाभिकीय पुनःचक्रण बोर्ड
NUCLEAR RECYCLE BOARD
समेकित नाभिकीय पुनःचक्रण संयंत्र (संचालन)
INTEGRATED NUCLEAR RECYCLE PLANT (OPERATION)

तारापुर कांप्लेक्स
TARAPUR COMPLEX
डाक घर: घिवली
POST OFFICE: GHIVALI
द्वारा: बोइसर (पश्चिम रेलवे)
VIA: BOISAR (Western Railway)
जिला: पालघर – 401 502
DIST: PALGHAR- 401 502

TENDER DOCUMENT

NIT NO. – BARC (T)/NRB/RWM/EI/2022-23/OPA/01 dated: 15/12/2022

"Supply, Installation, Testing, Commissioning and Training of CCTV & lighting System"

DATE OF ONLINE OPENING PART- A: 01/02/2023, AT 15:00 HRS.

TENDER DOCUMENT

Name of work: - "Supply, Installation, Testing, Commissioning and Training of CCTV & lighting System".

NIT NO.:- BARC (T)/NRB/RWM/EI/2022-23/OPA/01 Date: 15/12/2022

INDEX

CHECK LIST

BEFORE SUBMITTING THE TENDER THE TENDERES MUST CHECK THE FOLLOWING

SAY “YES’’ OR “NO”

SR. NO.	DESCRIPTION	YES/NO and Details if any
1	Have you submitted Earnest Money Deposit mention D.D. no. bank, date and amount? Is it in separate Envelope? Have you uploaded scanned copy of the EMD documents with the tender on CPPP portal?	
2	Have you filled unit rates RATE (With Tax) In Figures in BoQ.xls and uploaded same on CPPP portal?	
3	Do you agree to complete the work within the stipulated period as mentioned in NIT?	
4	Do you agree to all the conditions of contract in total?(Wherever you differ, you should bring it out in the covering letter)	
5	Have you visited the site and understood the nature of work completely?	
6	Are you registered with the Central, State, PWD/MES/Railways if so, state Registration Number.	
7	Have you attached latest Income Tax clearance Certificate/PAN and Bank Solvency Certificate issued by nationalized bank?	
8	Have you enclosed the tender drawings, technical bid and tender document with the offer?	
9	Have you Enclosed required documents in support of similar work experience and their performance and same is uploaded in the Form C of TechnicalBid.xls ?	
10	Have you ensured availability of required material from market?	
11	Have you filled and uploaded all details in TechnicalBid.xls and BoQPPS.xls?	

GOVERNMENT OF INDIA

BHABHA ATOMIC RESEARCH CENTRE

Nuclear Recycle Board, Tarapur

(SECTION – I)

NOTICE INVITING TENDER

NIT

Government of India
Department of Atomic Energy
Bhabha Atomic Research Centre
Nuclear Recycle Board
R&WM, Tarapur

सत्यमेव जयते

Date: - 15/12/2022

NOTICE INVITING e-TENDER

TENDER NOTICE NO: **BARC (T)/NRB/RWM/EI/2022-23/OPA/01**

1. On line item rate tender in two parts i.e. Part A – Documents related to eligibility criteria and Part B – Financial Bid are hereby invited through **e-Tendering mode** on behalf of the President of India by General Manager, R&WM, INRP(O), Nuclear Recycle Board, Bhabha Atomic Research Centre for the following work from eligible bidderson approved list of CPWD, MES Railways, State PWDs Public Sector Undertakings of Central or State Governments/ Central Autonomous bodies or those having adequate experience and capabilities to execute similar works of such magnitude.

i)	Name of Work	:	**Supply, Installation, Testing, Commissioning and Training of CCTV & lighting System.**
ii)	Location of Work	:	BARC- Tarapur site, Boisar, Maharashtra
iii)	Estimated Cost	:	Rs. 80000000 (Rupees EightCrore Only)
iv)	Earnest Money Deposit (EMD)	:	Rs. 1600000 (Rupees Sixteen Lakh Only)

Note : Earnest Money in original to be submitted preferably in the form of Fixed Deposit Receipt issued by Scheduled Bank / Demand Draft / Banker's Cheque of a Scheduled Bank, issued in favour of Pay and Accounts Officer, PREFRE BARC, Tarapur payable at Boisar, Maharashtra.

A part of Earnest Money is acceptable in the form of Bank Guarantee also. In such case minimum 50% of the Earnest Money or 20.00 Lakhs, whichever is less, shall be in the form prescribed above and balance can be accepted in the form of Bank Guarantee issued by a Scheduled Bank as per Appendix 'A' of Tender Part 'A'. The bank guarantee submitted as a part of Earnest Money Deposit shall be valid for a period of six months or more from the date of submission of the tender. The Earnest Money deposited along with the bid shall be returned after receiving the Performance guarantee (after confirmation).

vi)	Tender Processing Fee	:	**Rs.0/-**
vii)	Period of completion	:	12months/365 Days (The commencement of work is reckoned from the 15th day from the date of issue of work order or actual date of start of work whichever is earlier).
viii)	Dates of availability of Documents for download	:	From **26/12/2022 (10:00 Hrs.)**totill the last date and time of submission of online bidon websitehttps://eprocure.gov.in//eprocure/app.**NIT is also available on website www.barc.gov.in for view only.**
ix)	Date & Location of Pre-bid meeting	:	The biddersare requested to send their Pre-bid queries by email (mjaroli@barc.gov.in or omprakashpal@barc.gov.in) not later than **03/01/2023.** Pre-Bid meeting will be held on **09/01/2023 at 14:30Hrs at PREFRE-II Conference Room, BARCTarapur, Boisar(W), Maharashtra-401502.**The Pre-Bid

			meetingclarifications will be uploaded at https://eprocure.gov.in/eprocure/app website by **13/01/2023.**
x)	Period for online submission of tenders	:	**From 26/12/2022 (10:00 Hrs.) to 30/01/2023(15:00 Hrs)**
xi)	Date and time of online opening of Part A	:	**01/02/2023 (15:00 Hrs.)**
xii)	Date of opening of Part B of qualified bidders	:	Will be notified at a later date on https://eprocure.gov.in/eprocure/app.

Information, Eligibility Criteria, Conditions and Instructions

Information:

2. Tender document is prepared in two parts viz. Part 'A' (Documents related to eligibility criteria) and Part 'B' (Financial Bid). Part 'A' consists of Documents related to eligibility criteria viz. Section I – Notice Inviting e – Tender (English & Hindi versions), Section II – Form of Agreement and General Rules and Directions for the guidance of bidders, Memorandum, Section III – General Conditions of Contract, Additional conditions, Section IV – Special Instructions to bidders, Section V – Technical Specifications, Section VI – List of Tender Drawings, Section VII – Proforma of Schedules. Part 'B' (Financial bid) consists of Schedule 'A' – Schedule of Quantities and Rates.

   The bidders must have Class-III digital signature certificate. To participate in the tender, Prospective Bidders are required to Login in the Home page of the website https://eprocure.gov.in/eprocure/app with their **User ID / Password and Class III Digital Signature Certificate.**

   Prospective Bidders are required to download the **excel format** Price Bid and fill the **excel document**and upload the same **without renaming** it. Please refer Help Manual for submission of Tender / contact Help Desk as per NIT.

   A set of tender drawings (Section VI) for the mentioned works will be made available to the bidder only for inspection in the office of Superintendent, E&I section, PREFRE, R&WM, INRP(O), NRB, BARC, Tarapur, Post-office Ghivli, Palghar Maharashtra Pin code-401502up to a working day before the last day of submission of tender and bidders, if required can come personally to study the drawings and the same shall not be available on the website.

   Prospective bidder or his authorized representative shall bring photo identification like Passport, Voter's Identity Card, Driving License; PAN card for entry into BARC premises which is a restricted place. Prior intimation on phone or email shall have to be taken by the bidder so as to arrange entry to NRB, BARC, Tarapur.

   All the above documents will form part of Agreement after award of work to the successful bidder.

Initial Eligibility Criteria:

3. The bidder should have the following:

   (a) Registration in Appropriate Class of bidders, if any.
   (b) Bank Solvency Certificate of a Scheduled Bank for a minimum of **Rs. 3, 20, 00,000**and should not be older than one year from the date of opening of tender.
   (c) Average Annual Financial Turnover should be at least **Rs. 8,00,00,000,** during the immediate last three consecutive financial years ending **31stMarch 2021.** This should be duly audited by a registered Chartered Accountant (Scan copy of certificate from Chartered Accountant to be uploaded). Year in which no turnover is shown, would also be considered for working out the average.

(d) Should not have incurred any loss in more than two years during last five years ending **31st March 2021.** This should be duly certified and audited by registered Chartered Accountant.

(e) Carried out similar works during last 7 years.

(f) The bidder should own constructions equipmentas per list required for the proper and timely execution of the work. Else, he should certify that he would be able to manage the equipment by hiring etc. and submit the list of firms from whom he proposes to hire.

(g) The bidder should have sufficient number of Technical and Administrative employees for the proper execution of the contract.

(h) Copy of valid GST Registration Certificate.

(i) Copy of Permanent Account Number (PAN) Card.

(j) PF Registration Number.

(k) TDS Certificate for proof of value of work executed for various clients.

(l) Bidder shall furnish a declaration that he has not been debarred from tendering by any Govt. Department /Public Sector Enterprise in last 7 years. In case the bidder is debarred, they should declare the details of debarment and submit copy of the order of debarment. The competent authority will decide on qualification of the bidder based on the merits of the case.

(m) Experience of having successfully and satisfactorily completed similar works in all respect (based on certification of performance as main contractor by client of the works) during last Seven (07) years endingthe previous day of last date of submission of tender. Works in Joint Ventures shall not be considered.

(n) The bidder should be "Class-I Local Supplier" as defined in Public Procurement (Preference to Make in India), Order-2017, Order No. "P-45021/2/2017-B.E. –II, Revision, dated 16/09/2020 and as amended from time to time.

4. The bidder should have satisfactorily completed (based on certification of performance by client of the works)

i) 3 (Three) similar works, each of value not less than (Rs. 3,20,00000) 40% of the estimated cost, or

ii) 2 (Two) similar works, each of value not less than Rs. (Rs. 4,80,00000) 60% of the estimated cost, or

iii) 1 (One)similar work of value not less than (Rs. 6,40,00000) 80% of estimated cost

iv) In case the estimated cost is more than 20 Crore, in addition to the above, one completed work of any nature (either part of above works or a separate one) costing not less than the amount equal to 40% of the estimated cost with some Central Government Department/State Government Department/Central Autonomous Body/State Autonomous Body/Central Public Sector undertaking/State Public Sector Undertaking/ City Development Authority/ Municipal Corporation of City formed under any Act by Central/State Gov. and published in Central/State Gazette

during the last 7 (Seven) years ending on the previous day of last date of submission of tenderand if the eligible similar works are not carried out in Central Government Department / State Government Department / Public Sector Undertaking of Central or State Governments / Central Autonomous Bodies, TDS certificates should be produced by bidder for the same.

5. For the purpose, 'cost of work' shall mean gross value of the completed work including the cost of materials supplied by the Govt./ Client, but excluding those supplied free of cost. For the purpose of this clause, 'Similar Work' means "Supply, installation and commissioning of CCTV surveillance system having minimum of 75 nos. of IP based CCTV camera". The similar works should be a work executed in India. The value of joint venture work is not acceptable.

6. The value of executed works shall be brought to the current costing level by enhancing the actual value of work at simple rate of 7% per annum, calculated from the date of completion to the last date of submission of bid.

7. The bidding capacity of the bidder applicable should be equal to or more than the estimated cost of the work put to tender. The bidding capacity shall be worked out the following formula:

Bidding Capacity = [A x N x 2]- B

Where,

A = Maximum turnover in works executed in any one year during last five years taking into account the completed as well as works in progress. **The value of completed works shall be bought to current costing level by enhancing at a simple rate of 7% per annum.**

N = Number of years prescribed for completion of work for which bids have been invited.

B= Value of existing commitments and on-going works to be completed during the period of completion of work for which bids have been invited.

8. Even though any bidder may satisfy the above requirements, he would be liable to disqualification, if:

(i) bidder has made misleading or false representation or deliberately suppressed the information in the forms, statements and enclosures required in the eligibility criteria document,

(ii) bidder has record of poor performance such as abandoning work, not properly completing the contract or financial failures/weaknesses etc.

(iii) bidder has involved in any malpractices or fraudulent activities with the purpose of getting an unfair advantage.

(iv) If any adverse input received against bidder from DAE Security.

9. Bidder should be a registered firm/company in India. Joint ventures and/or Consortiums are not acceptable.

Conditions:

10. After opening of Part 'A' of tender Competent Authority may constitute an inspection team which may visit selected work sites of ongoing / completed works of the biddersto evaluate the capability of the bidders based on the following:-

a) Financial capability and their turnover during the last 5 years.
b) Technical capabilities of the company in the light of subject work.
c) Nature of works executed by the bidder during last 7 years.
d) Organizational structure of the company.
e) Necessary Resource required by company to carry out the subject work.
f) Time & quality consciousness.
g) Tendency of the company with regard to making extraneous claims and disputes.
h) Site planning ability.
i) Tendency of the company to award the work on back to back / subletting.
j) Nature of debarment of the bidder (if any) by any government department/public sector enterprises

Evaluation of documents related to eligibility criteria: This will be done in line with Annexure-1 of Appendix-20 of CPWD Works Manual 2014 before opening the financial bid based on eligibility criteria referred in NIT.

Financial evaluation of bids: The date of opening of Financial Bid shall be conveyed to the bidders whose Part-A (Documents related to eligibility criteria) is found satisfactory to the department and Part-B (Financial Bid) of such bidders only shall be opened.

The estimated cost of work indicated is only approximate and the contractor shall workout the rates in detail.

11. The applicant should also produce an affidavit in original along with the bid**before opening of Part B** in the following format on Rs.100 stamp paper attested by a Public Notary:

"I/We undertake and confirm that eligible similar work(s) has/have not been got executed through another contractor on back to back basis. We confirm that the company is not under liquidation. Further we have understood that, if such a violation comes to the notice of Department, then I/We may be debarred for tendering in NRB, BARC Contracts in future."

Also

"I have read the clause in Annexure-I regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent

Authority. I hereby certify that this bidder fulfils all requirements in this regard and is eligible to be considered. (Where applicable, evidence of valid registration by the Competent Authority shall be attached.)"

12. No modifications in the tender shall be allowed after opening Part 'A'.

13. Tenders with any condition including conditional rebate shall be rejected. However, tenders with unconditional rebate will be accepted.

14. If any information furnished by the applicant is found to be incorrect, they shall be liable to be debarred from tendering/ taking up works in BARC in future and the Government shall without prejudice to any right or remedy, be at liberty to forfeit the Earnest Money absolutely. Further, if such a violation comes to the notice of Department before start of the work, the Engineer-in-charge shall be free to **forfeit** the entire amount of Earnest Money Deposit/Performance Guarantee.

15. The time allowed for carrying out the work will be reckoned from the 15th day from the date of issue of work order or actual date of start of work whichever is earlier.

16. Tender shall be kept valid for **180 days** from the Last date of closing of online submission of tenders. If any bidder withdraws his tender within the validity period and before award of work whichever is earlier or makes any modifications in the terms and conditions of the tender which are not acceptable to the department, then the Government shall without prejudice to any right or remedy, be at liberty to forfeit 50% (Fifty Percent) of the Earnest Money absolutely. Further, the bidder shall not be allowed to participate in the re-tendering process of the work.

17. In case the last date opening of tender is declared as holiday, the date shall be treated as postponed to the next working day, correspondingly.

18 The prospective bidder should upload scanned copy of the EMD documents such as FDR/DD/BC/BG as described in 1(iv) and original(s) shall be submitted at the office of R&WM, E&I section, PREFRE, INRP(O), NRB, BARC, Tarapur, Boisar, Post office Ghivli, Boisar, Palghar Maharashtra Pin code-401502 before opening of Part-B failing to which the tender will be rejected.

19. The Security Deposit at 2.5% of gross amount of the bill shall be deducted from each running bill as well as final bill of the contractor till the sum deducted will amount to Security Deposit of 2.5% of the tendered value of the work.

The Security Deposit will also be accepted in the form of Demand Draft/Banker's Cheque from Scheduled Bank. Fixed Deposit Receipt of a Scheduled Bank will also be accepted.

20. In addition, the contractor shall be required to deposit an amount equal to 3% of the tendered value of the contract as performance guarantee in the form of Demand Draft / Fixed Deposit Receipt / Bank Guarantee / Banker's Cheque from Scheduled bank to be submitted within 15 days from the date of issue of work order or before commencement of work whichever is earlier.

21. If the successful bidder, fails to furnish the prescribed performance guarantee within 15 days (and subject to grace period mentioned in Schedule F) from the date of issue of work order or before commencement of work, whichever is earlier, the department (BARC) shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely without any notice.

22. The acceptance of tender shall rest with department which does not bind itself to accept the lowest tender and reserves to itself the authority to reject or all of the tenders received, without assigning any reason. All tenders in which any of the prescribed conditions are not fulfilled or incomplete in any respect are liable to be rejected.

23. Canvassing in connection with tenders is strictly prohibited and the tenders submitted by the bidders who resort to canvassing will be liable for rejection.

24. The department reserves the right to accept the whole or only part of the tender and the bidder shall be bound to perform the same at the rates quoted.

25. i) Quoted rates shall be inclusive of GST and shall be payable by the bidder and NRB, BARC will not entertain any claim whatsoever in this respect. The biddershould beregistered under Goods & Service Tax (GST) and GST as applicable as per extantorder on the work shall be paid by the contractor to concerned tax authorities.

ii) Labour welfare cess, if applicable, shall be recovered from each bill paid to the contractor.

iii) Income tax, GST TDS and any other tax as applicable shall be deducted from each bill paid to the contractor.

iv) All the workers are to be paid applicable minimum wages.

v) The bidder should be registered under EPF and ESIC. The contractor shall pay EPF and ESIC of contract workers to concerned Agencies. EPF and ESIC (employer's contribution in both) shall be reimbursed by the Department after satisfying that it has been actually and genuinely paid by the contractor. The bidder should not consider EPF and ESIC in his rates.

26. **The successful bidder whose tender is accepted will be required to obtain Police Verification Certificate (PVC) issued by Police Department at his own cost for all his workmen i.e. Engineers, Supervisors and Laborer's to work inside BARC**

In case of receipt of any adverse character and antecedent remarks / notification against the Contractor/ Company / firm / proprietor and / or his contract personnel, consequent to the security vetting, BARC reserves absolute right to terminate the contract forthwith without assigning reason/ show cause notice. Under the circumstance the Contractor will have no right to claim good any losses / liability that may be incurred as consequence to the above action initiated by BARC. BARC also reserves the right to forfeit in part/full performance security and/ or security deposit in possession of the Government for failure on the part of the contractor to abide / adhere to the Security instruction issued by DAE / BARC from time to time.

Instructions:

27. The bidder should be registered with https://eprocure.gov.in/eprocure/appThosebidders not registered on the website mentioned above, are required to get registered. If needed, they can be imparted training for online bidding process as per details available on the website.

28. Tenders will be received online up to time & date as mentioned above. Part A will be opened on the time & date as mentioned above. After opening of Part A, for evaluation, the bidder's ongoing / completed work sites & offices may be visited. The documents related to eligibility criteria will be evaluated and accordingly bidders will be qualified. Qualified bids shall then be opened at notified date and time. Date of opening of Part 'B' (Financial Bid) will be intimated to all bidders by email.

29. The bidder can login and see the status of Bids after opening.

30. Bidder must ensure to quote rate of each item. The Financial bid is provided as BoQPPS.xls along with this tender document at https://eprocure.gov.in/eprocure/app. Bidders are advised to download this BoQPPS.xls as it is and quote their rates in the permitted (unprotected) cells which appears in different colour and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. **Bidder shall not tamper / modify downloaded price bid template in any manner**. If any cell is left blank and no rate is quoted by the bidder, rate of such item shall be treated as "0" (ZERO).

31. List of Documents to be scanned from original & uploaded within the period of bid submission by bidder:

i) Financial Turn Over certified by CA.
ii) Profit & Loss statement certifiedby CA.
iii) Latest Bank Solvency Certificate.
iv) List of Construction Plants and Machinery/ equipmentrequired for the execution of the work
v) List of Technical Staff required for the execution of the work
vi) PAN (Permanent Account Number) Card
vii) Copy of EMD documents such as FDR/DD/BC/BG
viii) List of Similar Works completed in last seven years indicating i) Agency for whom executed, ii) Value of work, iii) Stipulated and Actual time of completion, iv) Performance certificates of the eligible similar works from the clients.
List of Works in Hand indicating: i) Agency ii) Value of Work, iii) Stipulated time of completion / present position.
ix) Certificates:
a) Registration certificate, if any
b) Certificates of Work Experience / Performance Certificates
c) GST Registration Certificate
d) PF Registration certificate.
x) Undertaking that the eligible similar works(s) have not been executed through another contractor on back to back basis.
xi) Declaration as per Part A: Section II & Clause 11 of General Conditions of Contract.
xii) Valid Electrical license, if applicable
xiii) Declaration that the bidder has not been debarred as described in 3(l)
xiv) Undertaking pursuant to section 206AB of Income Tax Act, 1961 in the format attached in Annexure-II in the company letter head.
xv) Undertaking in official letter head regarding be “Class-I Local Supplier” as defined in Public Procurement (Preference to Make in India) as per Annexure-III

Note: During technical evaluation relevant documents, if any, can be asked by inspection committee for submission.

Notes:

1. Registered bidders can only submit / upload tenders.
2. Interested agencies may visit website https://eprocure.gov.in/eprocure/app for registration.
3. Contact or assistance / clarifications dial to 8956680373/74/75/76/77/78/79/80 (ext-65147/65123) and (02525)265123/265147
Fax: (02525)244158
4. Contact for assistance for registration and participation in e-Tendering:
   a) Shri. Bhushan Kumar and Shri. Mayur Jadhav Ph no. 022-25487480
   b) For any technical related queries please call at 24 x 7 Help Desk Number.
      1) 0120-4001 002
      2) 0120-4001 005
      3) 0120-6277 787
5. Email Ids for sending request for site visit / clarifications/ Pre Bid Meeting
To: omprakashpal@barc.gov.in/mjaroli@barc.gov.in

In case of any difference in English and Hindi version of NIT, the English version will prevail.

Sd/-

GM, R&WM, INRP(O)
NRB, BARC, Tarapur

For and on behalf of President of India

Annexure-I to NIT No: BARC (T)/NRB/RWM/EI/2022-23/OPA/01

I. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority.

II. "Bidder" (including the term 'tenderer', 'consultant, or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.

III. "Bidder from a country which shares a land border with India" for the purpose of this order means: -

a. An entity incorporated, established or registered in such a country; or
b. A subsidiary of an entity incorporated, established or registered in such a country; or
c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
d. An entity whose beneficial owner is situated in such a country; or
e. An Indian (or other) agent of such an entity; or
f. A natural person who is a citizen of such a country; or
g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above.

IV. The beneficial owner for the purpose of (iii) above will be as under:

1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.
Explanation:
a. "Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent. of shares or capital or profits of the company.
b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements

2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership

3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals

4. Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official

5. In case of trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

V. An Agent is a person employed to do any act for another, or to represent another in dealings with third person.

VI. The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority.

Annexure-II to NIT No:BARC (T)/NRB/RWM/EI/2022-23/OPA/01

TO WHOMSOEVER IT MAY CONCERN

Undertaking pursuant to Section 206 AB of the Income Tax Act 1961
Declaration confirming filling of Income Tax Return from immediate two preceding years.

I, _____ [Name], in the capacity of Individual/ Proprietor/ Partner/ Director/ Authorized signatory of ---------- [Entity Name] with PAN _____, do hereby make the following declaration as required under the relevant provision of the Income Act ,1961 (hereinafter referred as 'the Act'):

1. That I/We am/are authorized to make this declaration in the capacity as Individual / Proprietor/ Partner/ Director.
2. I/We hereby declare and confirm that I/We do not fall under the definition of 'specified person' as provided in section 206AB of the IT Act.
3. I/We have duly filed return of income for FY ------ & FY ------- within due date as per Section 139(1) of the Income-tax Act, 1961 – Yes / No (Strike out whichever is not applicable).
4. IF return has been filed the details are as follows:

I/We, _____ having PAN_____, hereby confirm that the provision of Section 206 AB is not applicable in my/our case as I/We am/are regular in filling of Income Tax Return. The details (along with proof of documents) of acknowledgement numbers and date of filling of Income Tax Return for last two financial years are furnished below:

S. No.	Financial Year / (Assessment Year)	Date of Filing Income Tax Return	ITR Acknowledgement Number
1	---------- / (----------)		
2	---------- / (----------)		

5. I/We hereby take responsibility for any loss/liability fully including any Tax, interest, penalty, etc. that may arise due to incorrect reporting of above information.

All the aforesaid representations are true and correct, and we/I agree to furnish any evidence required at any time in support thereof.

On behalf of _____

<< Name of the authorised signatory>>

<< Designation>>
Name of the Entity:

Seal :

Date :

Annexure-III

Undertaking for t*he provisions of* Public Procurement (Preference to Make in India), Order-2017, Order No. P-45021/2/2017-B.E. –II, Revision, dated 16/09/2020 and as amended from time to time.

NIT No. : BARC (T)/NRB/RWM/EI/2022-23/OPA/01

NAME OF WORK: Supply, Installation, Testing, Commissioning and Training of CCTV & lighting System

In reference to above mentioned Tender reference, I/we M/s…….. (Supplier Name) hereby certify that the products/ Services offered ---------- (Name of the Work) meet the requirement of the minimum local content as prescribed for "Class -1 Local Supplier" as mentioned in DPIIT order of Public Procurement (Preference to Make in India), Order-2017, Order No. "P-45021/2/2017-B.E. –II, Revision, dated 16/09/2020 and as amended from time to time.

We hereby confirm that the Local content for above mentioned work is……. % of total value of Work order.

Seal and Signature of Authorised Signatory.

Note: In case Procurement cost exceeds Rs. 10 Crore, this Percentage of Local content shall be certified statutory auditor/ cost auditor of company/ practicing cost accountant /practicing chartered accountant as defined in the above order.

GOVERNMENT OF INDIA

BHABHA ATOMIC RESEARCH CENTRE

Nuclear Recycle Board, Tarapur

(SECTION – II)

GENERAL RULES AND DIRECTIONS

GENERAL RULES AND DIRECTION

1. All works 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 application, and the amount of Security Deposit and Performance Guarantee to be deposited by the successful bidder and the percentage, if any, to be deducted from the bills. Copies of the specifications, designs and drawings 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 the 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 authorising him to do so, such power of attorney to be produced with the tender, and it must disclose that the firm is duly registered under the Indian Partnership Act, 1952.

3. Receipts for payments made on account of work, when executed by a firm, must also be signed by all the partners, except where the 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 identifications sign copies of the specifications and other documents mentioned in Rule 1. In the event of a tender being rejected, the earnest money shall thereupon be returned to the 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 an acknowledgment of 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 Cashier.

8. The memorandum of work tendered for and the schedule of materials to be supplied by INRPC, NRB 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 bidder 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 bidders 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 bidders 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 rate 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 the work will be required to be executed accordingly.

11. In case of any tender where unit rate of any item / items appear unrealistic, such tender will be considered as unbalanced and in case the bidder 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 'Paisa' should be written at the end. Unless the rate is in whole rupees and followed by the word `only' it should invariably be up to 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 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/-) or Government Securities or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the prescribed form.

(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 **2.5%** of the tendered value of the work. The Security deposit will be collected by deductions from the running bills as well as final bill of the contractor at the rates mentioned above. The Security amount will also be accepted in cash or in the shape of Government Securities or Fixed Deposit Receipt of a Scheduled Bank or State Bank of India will also be accepted for this purpose provided confirmatory advice is enclosed. **Earnest Money deposited along with bid shall be returned after receiving performance Guarantee.**

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. GST or any other tax applicable in respect of inputs procured by the contractor for this contract shall be payable by the contractor and Government will not entertain any claim whatsoever in respect of the same. However, component of GST at time of supply of service (as provided in CGST Act 2017) provide by the contract shall be varied if different from that applicable on the last date of receipt of tender including extension if any.

16. The contractor shall give a list of both gazetted and non-gazetted NRB/BARC employees related to him.

17. 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.

18. 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, horticulture work, roads and paths etc. The bidder, apart from being a registered contractor (B&R) of appropriate class, must associate himself with agencies of appropriate class which are eligible to tender for sanitary and water supply drainage, electrical and horticulture works in the composite tender.

19. The contractor shall submit list of works which are in hand (progress) in the following form:

Name of work	Name & particulars of work is being executed	Value of work:	Position of works in progress:	Remarks
1	2	3	4	5

20. The contractor shall comply with the provisions of the Apprentices Act 1961, and the rules and orders issued there under from time to time. If he fails to do so, his failure will be reach of the contract and the Chief Executive, NRB may in his discretion, without prejudice to any other right or remedy available in law, cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.

ITEM RATE TENDER FOR WORKS

(a)General Description (Name of Work)::"Supply, Installation, Testing, Commissioning and Training of CCTV & lighting System".

(b) Estimated Cost : Rs. 80000000/-(Rupees Eight Crore Only)

(c) Earnest Money :Rs. 1600000/- (Rupees Sixteen Lakhs only)

(d) Security Deposit : 2.5% of the tendered value of the work

(e) Performance Security: 3 % of the tendered value of the work

I / We have examined the notice inviting tender, Schedule A, B, C, D, E & F, specifications applicable, Drawings, designs, General Rules & Directions, Conditions of Contract, Clauses of Contract, Special Conditions & other documents and rules referred to in the conditions of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified for the President of India within the time specified in Schedule 'F' viz., schedule of quantities and in accordance in all respect with the specifications, designs, drawing and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of contract and with such materials as are provided for, by, and in respect of accordance with, such conditions so far as applicable.
We agree to keep the tender open for one hundred and 180 (One Hundred Eigthy) days from the due date of its opening

If I/We, fail to furnish the prescribed performance guarantee within prescribed period. I/We agree that the said President of India or his successors, in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if I/We fail to commence work as specified, I/We agree that President of India or the successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise they said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form. Further, I/We agree that in case of forfeiture of Earnest Money & Performance Guarantee as aforesaid. I/We shall be debarred for participation in the re-tendering process of the work.
Further, I / we agree that in case of forfeiture of earnest money or both earnest money & performance guarantee as aforesaid, I / we shall be debarred for participation in the re-tendering process of the work.

I/We undertake and confirm that eligible similar work(s) has/have not been got executed through another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/we shall be debarred for tendering in NRB in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.

DECLARATION

I/We, hereby declare that I/We shall treat the tender documents drawings and other records connected with the work as Secrete/Confidential documents and shall not communicate information /derived there from to any person other than a person to whom I/We am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the state.
Dated_____ day of_____.

BIDDERS SIGNATURE & SEAL

Witness .....
Address.....
.....
Occupation .....

ACCEPTANCE

The above tender is hereby accepted by me for and on behalf of the President of India.
Dated the _____Day of _____

General Manager,
R&WM,INRPO,NRB, BARC(T)
For and on behalf of the President of India

GOVERNMENT OF INDIA

BHABHA ATOMIC RESEARCH CENTRE

Nuclear Recycle Board, Tarapur

(SECTION – III)

GENERAL CONDITIONS OF CONTRACT

III (1) - CONDITIONS OF CONTRACTS

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 President of India and the Contractor, together with the documents referred to therein including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Engineer-in-Charge and all these documents taken together, shall be deemed to form one contract and shall be complementary to one another.

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

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

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

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

IV. The **'President'** means the President of India and his successors.

V. The 'Engineer-in-Charge' means the authorised representative or, Head as the case may be of the INRPO, Nuclear Recycle Board, Tarapur who shall supervise and be in charge of the work and who shall sign the contract on behalf of the President.

VI. 'Government' or 'Government of India' shall mean the President of India.

VII. Accepting Authority shall mean the authority mentioned in Schedule 'F'.

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

IX. 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.

X. 'Contract Price' means the sum named in the Tender subject to such additions there to or deductions there from as may be made under the provisions herein before contained.

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 up to the date of receipt of the tender.

XII. **Department** means Nuclear Recycle Board (NRB), Department of Atomic Energy, Government of India which invites tenders on behalf of President of India as specified in Schedule - F.

XIII. District Specifications means the specifications followed by the State Government in the area where the work is to be executed.

XIV. 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.

XV. 'Tendered value' means the value of the entire work as stipulated in the letter of award.

XVI.GST shall mean Goods and Service Tax- Central, State and Inter State.

SCOPE AND PERFORMANCE –

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.

WORKS TO BE CARRIED OUT –

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 – B) 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.

SUFFICIENCY OF TENDER –

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.

DISCREPANCIES AND ADJUSTMENT OF ERRORS –

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) 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 there from 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.

SIGNING OF 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 C.P.W.D Form as mentioned in Schedule 'F' consisting of:
a) Various standard clauses with corrections up to the date stipulated in Schedule 'F' along with annexure thereto.

b) C.P.W.D. Safety Code.

c) Model Rules for the protection of health, sanitary arrangements for workers employed by CPWD or its contractors.
d) CPWD Contractor's Labour Regulations.
e) List of Acts and omissions for which fines can be imposed.

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

III (2) - 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, (not withstanding and/or without prejudice to any other provisions in the contract) within period specified in **Schedule - F** from the date of issue of letter of acceptance. This period can be further extended by the Engineer-in-charge 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 Bankers cheque/Demand draft of any Scheduled Bank (in case guarantee amount is less than Rs. 1, 00,000/-) or Fixed deposit receipts / Bank guarantee/Pay Order from scheduled bank or the State Bank of India in accordance with the form annexed as Appendix hereto. In case a fixed deposit receipt of any Bank is furnished by the contractor to the Government as part of the performance guarantee and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the Government to make good the deficit.

ii) The Performance Guarantee shall be initially valid 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. However, in case of contracts involving maintenance of building and services/any other work after construction of same building and services/other work, then 50% of Performance Guarantee shall be retained as Security Deposit. The same shall be returned year wise proportionately

iii) The Engineer-in-charge shall not make a claim under the Performance guarantee except for amounts to which the President of India 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 President of India any amount due, either as agreed by contractor or determined under any of the Clauses/Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer-in-charge.

(iv) In the event of the contract being determined or rescinded under provisions of any of the clause /condition of the agreement, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of the President of India.

(v) On substantial Completion of any work which has been completed to such an extent that the intended purpose of the work is met and ready to use, then a provisional Completion certificate shall be recorded by the Engineer-in-Charge. The provisional certificate shall have appended with a list of outstanding balance item of work that need to be completed in accordance with the provisions of the contract.
This provisional completion certificate shall be recorded by the concerned Engineer-in–charge with the approval of competent authority defined in 'Schedule F'. After recording of the provisional Completion Certificate for the work by the competent authority, the 80% of performance guarantee shall be returned to the contractor, without any interest.

However in case of contracts involving Maintenance of building and services / any other work after construction of same building and services/ other work, then 40% of performance guarantee shall be returned to the contractor, without any interest after recording the provisional Completion certificate.

CLAUSE 1A: RECOVERY OF SECURITY DEPOSIT

The person/ persons whose tender(s) may be accepted (hereinafter called the contractor) shall permit Government at the time of making any payment to him for work done under the contract to deduct, a sum at the rate of 2.5% of the gross amount of each running and final bill till the sum deducted will amount to security deposit of 2.5% of the tendered value of the work Such deduction will be made and held by Government by way of security deposit unless he/they has/have deposited the amount of security at the rate mentioned above in cash or in the form of Government securities or fixed deposit receipts. In case a fixed deposit receipt of any Bank is furnished by the contractor to the Government as part of the security deposit and the Bank is unable to make payment against the

said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the Government to make good the deficit.

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

The security deposit shall be collected from the running bills of the contractor at the rates mentioned above and the Earnest Money deposited at the time of tenders will be treated a part of the Security Deposit. The security deposit as deducted above can be released against bank guarantee issued by a scheduled bank, on its accumulations to a minimum of Rs.5 Lakhs subject to the condition that amount of such bank guarantee, except last one, shall not be less than Rs.5 Lakhs.

Provided further that the validity of bank guarantee including the one given against the earnest money shall be in conformity with provisions contained in clause 17 which shall be extended from time to time depending upon extension of contract granted under provisions of clause 2 and clause 5.

In case of contracts involving maintenance of building and services/any other work after construction of same building and services/other work, then 50% of Performance Guarantee shall be retained as Security Deposit. The same shall be returned year wise proportionately.

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

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

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

CLAUSE 2: COMPENSATION FOR DELAY

If the contractor fails to maintain the required progress in terms of Clause 5 or to complete the work and clear the site on or before the contract or justified extended date of completion, as per clause 5 (excluding any extension under Clause 5.5) as well as any extension granted under clauses 12 and 15, 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 may decide on the amount of Tendered Value of the work for every completed day/month (as determined) that the progress remains below that specified in Clause 5 or that the work remains incomplete.

This will also apply to items or group of items for which a separate period of completion has been specified. Compensation for delay of work - @1% 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 Sectional part of work as mentioned in Schedule 'F' For which a separate period of completion is originally given.

In case no compensation has been decided by the authority in Schedule 'F' during the progress of work, this shall be no waiver of right to levy compensation by the said authority if the work remains incomplete on final justified extended date of completion. If the Engineer in Charge decides to give further extension of time allowing performance of work beyond the justified extended date, the contractor shall be liable to pay compensation for such extended period. If any variation in amount of contract takes place during such extended period beyond justified extended date and the contractor becomes entitled to additional time under clause 12, the net period for such variation shall be accounted for while deciding the period for levy of compensation. However, during such further extended period beyond the justified extended period, if any delay occurs by events under sub clause 5.2, the contractor shall be liable to pay compensation for such delay.

Provided that compensation during the progress of work before the justified extended date of completion for delay under this clause shall be for non-achievement of sectional completion or part handing over of work on stipulated/justified extended date for such part work or if delay affects any

other works/services. This is without prejudice to right of action by the Engineer in Charge under clause 3 for delay in performance and claim of compensation under that clause.

In case action under clause 2 has not been finalized and the work has been determined under clause 3, the right of action under this clause shall remain post determination of contract but levy of compensation shall be for days the progress is behind the schedule on date of determination, as assessed by the authority in Schedule F, after due consideration of justified extension. The compensation for delay, if not decided before the determination of contract, shall be decided after of determination of contract .

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the Government. In case, the contractor does not achieve a particular mentioned milestone 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 as above. Withholding 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

In case, the contractor completes the work ahead of stipulated date of completion or justified extended date of completion as determined under clauses 5.3, 12 & 15, a bonus @ 1% (one per cent) of the tendered value per month computed on per day basis, shall be payable to the contractor, subject to a maximum limit of 5% (five per cent) of the tendered value. Provided that justified time for extra work shall be calculated on pro-rata basis as cost of extra work X stipulated period /tendered value. The amount of bonus, if payable, shall be paid along with final bill after completion of work. Provided always that provision of the Clause 2A shall be applicable only when so provided in 'Schedule F'.

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 right 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 for completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases.

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

ii. If the contractor has, without reasonable cause suspended the progress of work or has failed to proceed with the work with due diligence and continue to do so after a notice in writing of 7 days from the Engineer in charge.

iii. If the contractor fails to complete the work or section of work with individual date of completion on or before the stipulated or justified extended date, on or before such date of completion; and the Engineer in Charge without any prejudice to any other right or remedy under any other provision in the contract has given further reasonable time in a notice given in writing in that behalf as either mutually agreed or in absence of such mutual agreement by his own assessment making such time essence of contract and in the opinion of Engineer-in-Charge the contractor will be unable to complete the same or does not complete the same within the period specified.

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

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

vi. If the contractor shall enter into a contract with Government in connection with which commission has been paid or agree 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 had secured the contract with Government as a result of wrong tendering or other non-bonafide method of competitive tendering or commits breach of integrity agreement.

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

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

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

xi. If the contractor assigns, (excluding part(s) of work assigned to other agency(s) by the contractor as per terms of contract), 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 President of India shall have powers:

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

b) After giving notice to the contractor to measure up the work of the contractor and to take such whole, or the balance or part thereof as shall be 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 provisions aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this contract unless and until the Engineer-in-Charge has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

CLAUSE 3A: 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 or one month whichever is more, either party may close the contract by giving notice to the other party stating reasons. In such eventuality, the Performance Guarantee of the contractor shall be refunded within following time limits:
i)If the Tendered value of work is up to Rs. 45 lac: 15 days.
ii)If the Tendered value of work is more than Rs. 45 lac and up to Rs. 2.5 Crore: 21 days.
iii)If the Tendered value of work exceeds Rs. 2.5 Crore: 30 Days

Neither party shall claim any compensation for such eventuality. This clause is not applicable for any breah of the contract by either party.

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 not withstanding 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 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); and in the event of the contractor failing to comply with any such requisition, the Engineer-in-Charge may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and at his risk in all respects and the certificate of the Engineer-in-Charge as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the contractor.

CLAUSE 5: TIME AND EXTENSION FOR DELAY

The time allowed for execution of the Works as 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 notified by the Engineer-in-Charge, whichever is later. However, the handing over of site by the Engineer in Charge, in full or in part (if so provided in contract), shall be completed within two months from issue of acceptance letter. If the Contractor commits default in commencing the execution of the work as aforesaid, the performance guarantee shall be forfeited by the Engineer in Charge and shall be absolutely at the disposal of the Government without prejudice to any other right or remedy available in law.

5.1 As soon as possible but within twenty one days of award of work and in consideration of
a) Schedule of handing over of site as specified in the Schedule 'F'
b) Schedule of issue of designs as specified in the Schedule 'F'

i) The Contractor shall submit a Time and Progress Chart for each milestone. The Engineer- in-Charge may within 30 days thereafter, if required modify, and communicate the program approved to the contractor failing which the program submitted by the contractor shall be deemed to be approved by the Engineer-in-Charge. The work programme shall include all details of balance drawings and decisions required to complete the contract with specific dates by which these details are required by contractor without causing any delay in execution of the work. 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'.

ii) In case of non submission of construction programme by the contractor the programme approved by the Engineer-in-Charge shall be deemed to be final.
iii) The approval by the Engineer-in-Charge of such programme shall not relieve the contractor of any of the obligations under the contract.
iv) The contractor shall submit the Time and Progress Chart and progress report using the mutually agreed software or in other format decided by Engineer-in-Charge for the work done during previous month to the Engineer-in-charge on or before 5th day of each month failing which a recovery Rs. 2500/ - (for works costing upto Rs. 20 Crores) / Rs. 5000/- (for works costing more than Rs. 20 Crores) shall be made on per week or part basis in case of delay in submission of the monthly progress report.

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 of stores, which are the responsibility of Government to supply or non-availability or break down of tools and Plant to be supplied or supplied by Government or
vii) Any other cause like above which, in the reasoned opinion of the Engineer-in-Charge is beyond the Contractor's control.

viii) Then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer-in-Charge for entry in the hindrance register (physical or web-based as prescribed in Schedule 'F' but shall nevertheless use constantly his best endeavours 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.

The contractor shall have no claim of damages for extension of time granted or rescheduling of milestone/s for events listed in sub clause 5.2.

5.3 In case the work is hindered by any reasons, in the opinion of the contractor, by the Department or for someone for whose action the Department is responsible, the contractor may immediately give notice thereof in writing to the Engineer-in-Charge in the same manner as prescribed under sub Clause 5.2 seeking extension of time or rescheduling of milestone/s. The authority as indicated in Schedule 'F' shall, if justified, give a fair and reasonable extension of time and reschedule the mile stones for completion of work after due consideration of the same within 30 days of receipt of such request. In event of non application by the contractor for extension of time E-in-C after affording opportunity to the contractor may give, supported with a programme, a fair and reasonable extension within a reasonable period of occurrence of the event. Such extension of time or rescheduling of milestone/s shall be without prejudice to any other right or remedy of the parties in contract or in law; provided further that for concurrent delays under this sub clause and sub clause 5.2 to the extent the delay is covered under sub clause 5.2 the contractor shall be entitled to only extension of time and no damages

5.4 Request for rescheduling of Mile stones or 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 forms i.e. Form of application by the contractor for seeking rescheduling of milestones (Appendix-XVI) or Form of application by the contractor for seeking extension of time (Appendix –XVII) respectively to the authority as indicated in Schedule 'F'. The Contractor shall indicate in such a request the period by which rescheduling of milestone/ s or extension of time is desired.

With every request for rescheduling of milestones, or if at any time the actual progress of work falls behind the approved programme by more than 10% of the stipulated period of completion of contract, the contractor shall produce a revised programme which shall include all details of pending drawings and decisions required to complete the contract and also the target dates by which these details should be available without causing any delay in execution of the work. A recovery as specified in Schedule 'F' shall be made on per day basis in case of delay in submission of the revised programme.

5.4.1 In any such case the authority as indicated in Schedule 'F' may give a fair and reasonable extension of time for completion of work or reschedule the mile stones. Such extension or rescheduling of the milestones shall be communicated to the Contractor by the authority as indicated in Schedule 'F' in writing, within 30 days of the date of receipt of such request from the Contractor in prescribed form. In event of non application by the contractor for extension of time E-in-C after affording opportunity to the contractor may give, supported with a programme (as specified under 5.4 above), a fair and reasonable extension within a reasonable period of occurrence of the event.

5.5 In case the work is delayed by any reasons, in the opinion of the Engineer-in-Charge, by the contractor for reasons beyond the events mentioned in clause 5.2 or clause 5.3 or clause 5.4 and beyond the justified extended date; without prejudice to right to take action under Clause 3, the Engineer-in-Charge may grant extension of time required for completion of work without rescheduling of milestones. The contractor shall be liable for levy of compensation for delay for such extension of time.

CLAUSE 6: MEASUREMENTS OF THE 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 details description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications not withstanding 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 stipulate 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: COMPUTERISED MEASUREMENT BOOK

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

All measurements of all items having financial value shall be entered by the contractor and compiled in the shape of the computerized measurement book having pages of A-4 size as per the format of the department so that a complete record is obtained of all the items of works performed under the contract.

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

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

The final, fair, computerized measurement book given by the contractor, duly bound, with its pages machine numbered should be 100% correct, and no cutting or overwriting in the measurements would thereafter be allowed. If at all any error is noticed, the contractor shall have to submit a fresh computerized MB with its pages duly machine numbered and bound after getting the

earlier MB cancelled by the department. Thereafter, the MB shall be taken in the Divisional Office records, and allotted a number as per the Register of Computerized MBs. This should be done before the corresponding bill is submitted to the Division Office for payment. The contractor shall submit two spare copies of such computerized MBs for the purpose of reference and record by the various officers of the Department.

The contractor shall also submit to the department separately his computerized abstract of cost and the bill based on these measurements, duly bound, and its pages machine numbered along with two spare copies of the `bill.` Thereafter this bill will be processed by the Division Office and allotted a number as per the computerized record in the same way as done for the measurement book meant for measurements.

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

Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications not withstanding 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 checking and/or test checking the measurement of any work in order that the same maybe checked and/or test checked and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of checking and/or test checking measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer in charge or his 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 checking and/or test checking measurements without such notice having been given or the Engineer in charge`s consent being obtained in writing the same shall be uncovered at the contractor`s expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

Engineer in charge or his authorized representative may cause either themselves or through another officer of the department to check the measurements recorded by contractor and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.

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

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

No payment shall be made for work, estimated to cost Rs. **One lac** or less till after the whole of the work shall have been completed and certificate of completion given. For works estimated to cost over Rs. One lac, 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, 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 Asstt. Engineer together with the account of the material issued by the department, or dismantled materials, if any. In the case of works outside the headquarters of the Engineer- in-Charge, the period of ten working days will be extended to fifteen working days.

All such interim payments shall be regarded as payment by way of advances against final payment only and shall not preclude the requiring of bad, unsound and imperfect or unskilled work

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

Pending consideration of extension of date of completion, interim payments shall continue to be made as herein provided without prejudice to the right of the department to take action under the terms of this contract for delay in the completion of work, if the extension of date of completion is not granted by the competent authority.The Engineer-in-Charge in his sole discretion on the basis of a certificate from the Asstt. Engineer 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 to be sumitteed by the contractor within 10 days of the interim payment.

Payment in composite contracts

In case of composite tenders, running payment for the major component shall be made by EE of major discipline to the main contractor. Running payment for minor component shall be made by the Engineer-in-Charge of the discipline of minor component directly to the main contractor.

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 7A

No Running Account Bill shall be paid for the work till the applicable labour licenses, registration with EPFO, ESIC and BOCW Welfare Board, whatever applicable are submitted by the contractor to the Engineer-in-Charge.

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 his/their work people on the site in connection with the execution of the works as shall have been erected or constructed by the contractor(s) and cleaned off the dirt from all wood work, doors, windows, walls, 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 off the same as he thinks fit and clean off such dirt as aforesaid, and the contractor shall have no claim in respect of scaffolding or surplus materials as aforesaid except for any sum actually 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 of 0.1 % of Tendered Value or limit prescribed in Schedule F whichever is more as may be fixed by the Chief Executive,NRB concerned and in this respect the decision of the Chief Executive,NRB shall be final and binding on the contractor.

The contractor shall submit completion plan for Internal and External Civil, Electrical and Mechanical Services within thirty days of the completion of the work, provided that the service plans having been issued for execution by the Engineer-in-Charge, unless the contractor, by virtue of any other provision in the contract, is required to prepare such plans.

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 hereinunder, the period being reckoned from the date of receipt of the bill by the Engineer-in- Charge or his authorized Asstt. Engineer, complete with account of materials issued by the Department and dismantled materials.

i) If the Tendered value of work is up to Rs. 45 lac: 2 months
ii) If the Tendered value of work is more than Rs.45 lac and up to Rs. 2.5 Crore: 3 months
iii) If the Tendered value of work exceeds Rs. 2.5 Crore: 6 months

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

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 Chief Executive,NRB (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 Government or his signature on the bill or other claim preferred against Government before settlement by the Engineer-in-Charge of the account or claim by payment to the bank, registered financial, co-operative or thrift societies or recognized financial institutions. While the receipt given by such banks; registered financial, co-operative or thrift societies or recognized financial institutions shall constitute a full and sufficient discharge for the payment, the contractor shall 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 visa- vis the President of India.

CLAUSE 10: MATERIALS SUPPLIED BY GOVERNMENT

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

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

Such materials shall be supplied for the purpose of the contract only and the value of the materials so supplied at the rates specified in the aforesaid schedule shall be set off or deducted, as and when materials are consumed in items of work (including normal wastage) for which payment is being made to the contractor, from any sum then due or which may therefore become due to the

contractor under the contract or otherwise or from the security deposit. At the time of submission of bills, the contractor shall certify that balance of materials supplied is available at site in original good condition.

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

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

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

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

CLAUSE 10A: MATERIALS TO BE PROVIDED BY THE CONTRACTOR

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

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

i) SECURED ADVANCE ON NON-PERISHABLE MATERIALS

The contractor, on signing an indenture in the form in Annexure XVIII by the Engineer-in-Charge, shall be entitled to be paid during the progress of the execution of the work up to 75% 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) MOBILISATION ADVANCE

Mobilization advance not exceeding 10% of the tendered value may be given, if requested by the contractor in writing within one month of the order to commence the work. Such advance shall be in two or more installments to be determined by the Engineer- in-Charge at his sole discretion. The first installment of such advance shall be released by the Engineer-in-Charge to the contractor on a request made by the contractor to the Engineer-in- Charge in this behalf. The second and subsequent installments shall be released by the Engineer- in- Charge only after the contractor furnishes a proof of the satisfactory 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 Bonds not more than 6 in number from Scheduled Bank for the amount equal to 110% of the amount of advance and valid for the period till recovery of advance. This (Bank Guarantee from Scheduled Bank for the amount equal to 110% of the balance amount of advance) shall be kept renewed from time to time to cover the balance amount and likely period of complete recovery. Provided always that provision of Clause 10 B (ii) shall be applicable only when so provided in 'Schedule F'.

iii) PLANT MACHINERY AND SHUTTERING MATERIAL ADVANCE

An advance for plant, machinery & shuttering material required for the work and brought to site by the Contractor may be given if requested by the contractor in writing within one month of bringing such plant and machinery to site. Such advance shall be given on such plant and machinery

which in the opinion of the Engineer-in-Charge will add to the expeditious execution of work and improve the quality of work. The amount of advance shall be restricted to 5% percent of the tender value. In the case of new plant and equipment to be purchased for the work, the advance shall be restricted to 90% of the price of such new plant and equipment paid by the contractor for which the contractor shall produce evidence satisfactory to the Engineer-in-Charge. In the case of second hand and used plants and equipment, the amount of such advance shall be limited to 50% of the depreciated value of plant and equipment as may be decided by the Engineer-in-Charge. The contractor shall, if so required by the Engineer-in- Charge, submit the statement of value of such old plant and equipment duly approved by a Registered Valuer recognized by the Central Board of Direct Taxes under the Income- Tax Act, 1961. No such advance shall be paid on any plant and equipment of perishable nature and on any plant and equipment of a value less than Rs. 50,000/- Seventy five per cent of such amount of advance shall be paid after the plant & equipment is brought to site and balance twenty five percent on successfully commissioning the same.

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

1.Leasing company which gives certificate of agreeing to lease equipment to the contractor.

2.Engineer in Charge, and

3.The contractor.

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

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

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

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

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

iv) INTEREST AND RECOVERY

The mobilization advance and plant and machinery advance in (ii) & (iii) 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) INTEREST AND RECOVERY

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

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

If after submission of the tender, if the price of any marital incorporated in the work (excluding the material covered under clause 10 CA and not been a material supply for a Engineer in charge's store in accordance with clause 10 thereof) and/or wages of labour increases as a direct result of the coming into force of any fresh law or statutory rule or order (but not due to any variation of rate in GST applicable on such material(s) being considered under this clause) beyond the prices/wages prevailing at the time of the last stipulated date of receipt of tenders including extensions, if any, for the work during contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, then the amount of the contract shall accordingly be varied.

If after submission of the tender, the price of any material incorporated in the works (excluding the materials covered under Clause 10CA and not being a material supplied from the Engineer-in- Charge's stores in accordance with Clause 10 thereof) and/or wages of labour as prevailing at the time of last stipulated date of receipt of tender including extensions, if any, is decreased as a direct result of the coming into force of any fresh law or statutory rules or order (but not due to any changes of rate in sales tax/VAT, Central/State Excise/Custom Duty), Government shall in respect of materials incorporated in the works (excluding the materials covered under

Clause 10CA and not being material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 hereof) and/or labour engaged on the execution of the work after the date of coming into force of such law statutory rule or order be entitled to deduct from the dues of the contractor, such amount as shall be equivalent to the difference between the prices of the materials and/or wages as prevailed at the time of the last stipulated date for receipt of tenders including extensions if any for the work and the prices of materials and/or wages of labour on the coming into force of such law, statutory rule or order. This will be applicable for the contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2.

Engineer-in-Charge shall call books of account and other relevant documents from the contractor to satisfy himself about reasonability of increase in prices of materials and wages. The contractor shall, within a reasonable time of his becoming aware of any alteration in the price of any such materials and/or wages of labour, give notice thereof to the Engineer-in-Charge stating that the same is given pursuant to this condition together with all information relating thereto which he may be in position to supply. For this purpose, the labour component of 85% of the value of the work executed during period under consideration shall not exceed the percentage as specified in Schedule F, of the value of work done during that period and the increase/decrease in labour shall be considered on the minimum daily wages in rupees of any unskilled mazdoor, fixed under any law, statutory rule or order.

The cost of work for which escalation is applicable (W) is same as cost of work done worked out as indicated in sub-para (ii) of clause 10 CC except the amount of full assessed value of secured Advance.

CLAUSE 10CA: PAYMENT DUE TO VARIATION IN PRICES OF MATERIALS AFTER RECEIPT OF TENDER

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

However for work done/during the justified period extended as above, it will be limited to indices prevailing at the time of updated stipulated date of completion considering the effect of extra work (extra time to be calculated on pro-rata basis only as cost of extra work x stipulated period/tendered cost).

The increase/decrease in prices of cement, steel reinforcement, structural steel and POL shall be determined by the all India Wholesale Price Indices of materials as published by the Economic Advisor to Government of India, Ministry of Commerce and Industry and base price for materials as mentioned in Schedule 'F'. In case, price index of a particular material is not issued by the Ministry of Commerce and Industry then the price Index of nearest similar material as indicated in Schedule 'F' shall be followed.

In case, price index of a particular material is not issued by Ministry of Commerce and Industry, then the price index of nearest similar material as indicated in Schedule 'F' shall be followed.

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

Adjustment for component of individual material

$$V = \frac{P \times Q \times (CI - CIo)}{CIo}$$

Where,

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

P = Base Price of material as issued under authority of DG, CPWD or concerned Zonal Chief Engineer and as indicated in Schedule "F".

For Projects and Original Works

Q = Quantity of material brought at site for bonafide use in the works since previous bill excluding any such quantity consumed in the deviated quantity of items beyond deviation limit and extra /substituted item, paid/to be paid at rates derived on the basis of market rate under clause 12.2.

For Maintenance Works

Q = Quantity of material brought at site for bonafide use in the works since previous bill including any such quantity consumed in the deviated quantity of items beyond deviation limit paid at agreement rate and extra /substituted item being scheduled items, but excluding non schedule extra /substituted item paid/to be paid at market rate under clause 12.2.

CIo = Price index for cement, steel reinforcement bars structural steel and POL as issued by the DG, CPWD and corresponding to the time of base price of respective material indicated in Schedule

'F'. For other items, if any, provided in Schedule 'F', All India Wholesale Price Index for the material as published by the Economic Advisor to Government of India, Ministry of Industry and Commerce and corresponding to the time of base price of respective material indicated in Schedule 'F'.
CI =Price index for cement, steel reinforcement bars, structural steel and POL as issued under the authority of DG, CPWD for period under consideration. For other items, if any, provided in Schedule 'F', All India Wholesale Price Index for the material for period under consideration as published by Economic Advisor to Government of India, Ministry of Industry and Commerce.

Note:
i) In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the index prevailing at the time of updated stipulated date of completion considering the effect of extra work (extra time to be calculated on prorata basis only as cost of extra work x stipulated period/tendered cost) shall be considered.

Provided always that provisions of the preceding Clause 10 C shall not be applicable in respect of Materials covered in this Clause.

ii) If during progress of work or at the time of completion of work, it is noticed that any material brought at site is in excess of requirement, then amount of escalation if paid earlier on such excess quantity of material shall be recovered on the basis of cost indices as applied at the time of payment of escalation or as prevailing at the time of effecting recovery, whichever is higher.

iii) Cement mentioned wherever in this clause includes Cement component used in RMC brought at site from outside approved RMC plants, if any
iv) The date wise record of ready mix concrete shall be kept in a register and the cement consumption for the same shall be calculated accordingly.
v) If built-up steel items are brought at site from workshop, then the variation shall be paid for the structural steel up to the period when the built up item/finished product is brought at site.

CLAUSE 10 (CC): PAYMENT DUE TO INCREASE / DECREASE IN PRICES / WAGES EXCLUDING MATERIALS COVERED UNDER 10 CA AFTER RECEIPT OF TENDER FOR WORKS.

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

i)The base date for working out such escalation shall be the last stipulated date of receipt of tenders including extension, if any.
ii) The cost of work on which escalation will be payable shall be reckoned as below :

(a) Gross value of work done up to this quarter : (A)
(b) Gross value of work done up to the last quarter : (B)
(c) Gross value of work done since previous quarter (A-B) (C)
(d) Full assessed value of Secured Advance (excluding materials Covered under Clause 10 CA) fresh paid in this quarter : (D)
(e) Full assessed value of Secured Advance (excluding materials Covered under Clause 10 CA) recovered in this quarter : (E)
(f) Full assessed value of Secured Advance for which escalation Payable in this quarter (D-E): (F)
(g) Advance payment made during this quarter: (G)
(h) Advance payment recovered during this quarter: (H)
(i) Advance payment for which escalation is payable in this Quarter(G-H): (I)
(j) Extra items/deviated quantities of items paid as per Clause 12 Based on prevailing market rates during this quarter: (J)

Then, M = C+F+I-J

N = 0.85 M

k Less cost of material supplied by the department as perClause 10 and recovered during the quarter K

L Less cost of services rendered at fixed charges as per Clause34 and recovered during the quarter. L

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

iii) Components for materials (except cement, reinforcement bars, structural steel, POL or other materials covered under clause 10 CA) labour, etc. shall be pre-determined for every work and incorporated in the conditions of contract attached to the tender papers included in Schedule 'F'. The decision of the Engineer-in-Charge in working out such percentage shall be binding on the contractors.

iv) The compensation for escalation for other materials (excluding cement, reinforcement bars, structural steel, POL or other materials covered under clause 10 CA) shall be worked as per the formula given below:-

Adjustment for civil component (except cement, structural steel, reinforcement bars, POL and other materials covered under clause 10CA) / electrical component of construction 'Materials'

Vm = W x (Xm/100) x (M1-M1o)/M1o

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

W = Cost of Work done worked out as indicated in sub-para (ii) of Clause 10CC.

Xm = Component of 'materials' (except cement, structural steel, reinforcement bars POL and other materials covered under clause10CA) expressed as percent of the total value of work.

MI = All India Wholesale Price Index for civil component/electrical component* of construction material as worked out on the basis of All India Wholesale Price Index for Individual Commodities/ Group Items for the period under consideration as published by Economic Advisor to Govt. of India, Ministry of Industry & Commerce and applying weightages to the Individual Commodities/Group Items. (In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the index prevailing at the time of updated stipulated date of completion considering the effect of extra work (extra time to be calculated on prorata basis only as cost of extra work x stipulated period/ tendered cost, shall be considered.)

MIo = All India Wholesale Price Index for civil component/electrical component* of construction material as worked out on the basis of All India Wholesale

Price Index for Individual Commodities/Group Items valid on the last stipulated date of receipt of tender including extension, if any, as published by the Economic Advisor to Govt. of India, Ministry of Industry & Commerce and applying weightages to the Individual Commodities/Group items.

*Note: relevant component only will be applicable.

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

(a) The compensation for escalation shall be worked out at quarterly intervals and shall be with respect to the cost of work done as per bills paid during the three calendar months of the said quarter. The dates of preparation of bills as finally entered in the Measurement Book by the Assistant Engineer/ date of submission of bill finally by the contractor to the department in case of computerised measurement books shall be the guiding factor to decide the bills relevant to the quarterly interval. The first such payment shall be made at the end of three months after the month (excluding the month in which tender was accepted) and thereafter at three months' interval. At the time of completion of the work, the last period for payment might become less than 3 months, depending on the actual date of completion.

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

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

VL = W x (Y/100) x (L1-L10)/L10

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

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

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

L I : Minimum wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as applicable on the last date of the quarter previous to the one under consideration. (In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the minimum wage prevailing on the last date of quarter previous to the quarter pertaining to updated stipulated date of Completion considering the effect of extra work

(extra time to be calculated on prorata basis only as cost of extra work x stipulated period/ tendered cost, shall be considered.)

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

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

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

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

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

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

a) no such adjustment for the decrease in the price of materials and/or wages of labour aforementioned would be made in case of contracts in which the stipulated period of completion of the work is equal to or less than the time as specified in Schedule 'F'.

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

ix) Provided always that:

a) Where provisions of clause 10CC are applicable, provisions of clause 10C will not be applicable but provisions of clause 10CA will be applicable.

b) Where provisions of clause 10CC are not applicable, provisions of clause 10C and 10CA will become applicable.

Note: Updated stipulated date of completion (period of completion plus extra time for extra work for compensation under clause 10C, 10CA and 10CC

The factor of 1.25 taken into account for calculating the extra time under clause 12.1 for extra time shall not be considered while calculating the updated stipulated date of completion for this purpose in clause 10C, clause 10CA, and clause 10CC.

CLAUSE 10D: DISMANTLED MATERIALS GOVT. PROPERTY

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

CLAUSE 11: WORK TO BE EXECUTED AS PER 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 of NRB 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.

The completion cost of any agreement for Maintenance works including works of upgradation, aesthetic, special repair, addition/ alteration shall not exceed 1.25 times of Tendered amount.

Any further deviation beyond this limit up-to 1.5 times of tendered amount shall be approved by Chief Executive NRB through Tender Committee with recorded reason and in exceptional case, Chairman NRB through Board Meeting shall have full power to approve the deviation beyond 1.50 times of tendered amount with recorded reason and take suitable corrective action

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

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

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

12.2: DEVIATION, EXTRA ITEMS, PRICING

A. For Project and original works:

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, which shall include invoices, vouchers etc. and Manufacturer's specification for the work failing which the rate approved later by the Engineer- in-charge shall be binding and the Engineer-in-Charge shall within prescribed time limit 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.

B. For Maintenance works including works of upgradation, aesthetic, special repair, addition/ alteration:

In the case of Extra Item(s) being the schedule items (Delhi Schedule of Rates items), these shall be paid as per the schedule rate plus cost index (at the time of tender) plus/minus percentage above/ below quoted contract amount. Payment of Extra items in case of non-schedule items (Non-DSR items) shall be made as per the prevailing market rate.

DEVIATION, SUBSTITUTED ITEMS, PRICING

A. for Project and original works:

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)

B. for Maintenance works including works of upgradation, aesthetic, special repair, addition/ alteration:

In the case of substitute Item(s) being the schedule items (Delhi Schedule of Rates items), these shall be paid as per the schedule rate plus cost index (at the time of tender) plus/minus percentage above/ below quoted contract amount. Payment of substitute items in case of non-schedule items (Non-DSR items) shall be made as per the prevailing market rate.

Deviations, Deviated quantities, Pricing:

A.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 prescribed time limit 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.

B.For Maintenance works including works of upgradation, aesthetic, special repair, addition/ alteration:

In the case of contract items, which exceed the limits laid down in schedule F, the contractor shall be paid rates specified in the schedule of quantities.

The prescribed time limits for finalising rates for Extra Item(s), Substitute Item(s) and Deviated Quantities of contract items is within 30 days after submission of proposal by the contractor without observation of the Engineer-in-Charge.

12.3 A. For Project and original works:

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.

B.For Maintenance works including works of upgradation, aesthetic, special repair, addition/ alteration:

In case of decrease in the rates prevailing in the market of items for the work in excess of the limits laid down in Schedule F, 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 contract:

(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, over head 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 or during the progress of work, the purpose or object for which the work is being done changes due to any supervening cause and as a result of which the work has to be abandoned or reduced in scope the Engineer- in-Charge shall give notice in writing to that effect to the contractor stating the decision as well as the cause for such decision 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) Government shall have the option to take over contractor's materials or any part thereof either brought to site or of which the contractor is legally bound to accept delivery from suppliers (for incorporation in or incidental to the work) provided, however Government shall be bound to take over the materials or such portions thereof as the contractor does not desire to retain. For materials taken over or to be taken over by Government, cost of such materials as detailed by Engineer-in-Charge shall be paid. The cost shall, however, take into account purchase price, cost of transportation and deterioration or damage which may have been caused to materials whilst in the custody of the contractor.

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

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

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

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

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

In the event of action being taken under Clause 13 to reduce the scope of work, the contractor may furnish fresh Performance Guarantee on the same conditions, in the same manner and at the same rate for the balance tendered amount and initially valid up to the extended date of completion or stipulated date of completion if no extension has been granted plus 60 days beyond that. Wherever such a fresh Performance Guarantee is furnished by the contractor the Engineer-in-Charge may return the previous Performance Guarantee.

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

(iii) Fails to complete the work(s) or items of work with individual dates of completion, on or before the date(s) so determined, and does not complete them within the period specified in the notice given in writing in that behalf by the Engineer-in-Charge.

The Engineer- in-Charge without invoking action under clause 3 may, without prejudice to any other right or remedy against the contractor which have either accrued or accrue thereafter to Government, by a notice in writing to take the part work / part incomplete work of any item(s) out of his hands and shall have powers to:

(a) Take possession of the site and any materials, constructional plant, implements, stores, etc., thereon; and/or

(b) Carry out the part work / part incomplete work of any item(s) by any means at the risk and cost of the contractor.

The Engineer-in-Charge shall determine the amount, if any, is recoverable from the contractor for completion of the part work/ part incomplete work of any item(s) taken out of his hands and execute

at the risk and cost of the contractor, the liability of contractor on account of loss or damage suffered by Government because of action under this clause shall not exceed 10% of the tendered value of the work.

In determining the amount, credit shall be given to the contractor with the value of work done in all respect in the same manner and at the same rate as if it had been carried out by the original contractor under the terms of his contract, the value of contractor's materials taken over and incorporated in the work and use of plant and machinery belonging to the contractor. The certificate of the Engineer-in-Charge as to the value of work done shall be final and conclusive against the contractor provided always that action under this clause shall only be taken after giving notice in writing to the contractor. Provided also that if the expenses incurred by the department are less than the amount payable to the contractor at his agreement rates, the difference shall not be payable to the contractor.

Any excess expenditure incurred or to be incurred by Government in completing the part work/ part incomplete work of any item(s) or the excess loss of damages suffered or may be suffered by Government as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to Government in law or per as agreement be recovered from any money due to the contractor 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 subpara (i) above, the contractor may after receipt of such order serve a written notice on the Engineer-in-Charge requiring permission within fifteen days from receipt by the Engineer-in-Charge of the said notice, to proceed with the work or part thereof in regard to which progress has been suspended and if such permission is not granted within that time, the contractor, if he intends to treat the suspension, where it affects only a part of the works as an omission of such part by Government or where it affects whole of the works, as an abandonment of the works by Government, shall within ten days of expiry of such period of 15 days give notice in writing of his intention to the Engineer-in-Charge. In the event of the contractor treating the suspension as an abandonment of the contract by Government, he shall have no claim to payment of any

compensation on account of any profit or advantage which he might have derived from the execution of the work in full but which he could not derive in consequence of the abandonment. He shall, however, be entitled to such compensation, as the Engineer-in-Charge may consider reasonable, in respect of salaries and/or wages paid by him to his employees and labour at site, remaining idle in consequence adding to the total thereof 2% to cover indirect expenses of the contractor provided the contractor submits his claim supported by details to the Engineer-in-Charge within 30 days of the expiry of the period of 3months.

CLAUSE 15A: COMPENSATION IN CASE OF DELAY OF SUPPLY OF MATERIAL BY GOVT

The contractor shall not be entitled to claim any compensation from Government for the loss suffered by him on account of delay by Government in the supply of materials in Schedule 'B' where such delay is covered by the difficulties relating to the supply of wagons, force majeure or any reasonable cause beyond the control of the Government.

This clause 15 A will not be applicable for works where no material is stipulated.

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 Department or any organization engaged by the Department for Quality Assurance and of the Chief Technical Examiner's Office, and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing, present for that purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the contractor himself. If it shall appear to the Engineer-in-Charge or his authorized subordinates in-charge of the work or to the Chief Engineer in charge of Quality Assurance or his subordinate officers or the officers of the organization engaged by the Department for Quality Assurance or to the Chief Technical Examiner or his subordinate officers, that any work has been executed with unsound, imperfect, or unskillful workmanship, or with materials or articles provided by him for the execution of the work which are unsound or of a quality inferior to that contracted or otherwise not in accordance with the contract, the contractor shall, on demand in writing which shall be made within twelve months (six months in the case of work costing Rs. 10 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 LIABILE 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 (except such special materials, if any, as may in accordance with the contract be supplied from the Engineer-in-Charge's stores), machinery, tools & plants as specified in schedule F. In addition to this, appliances, implements, other plants, ladders, cordage, tackle, 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 theexpenses 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 18A: 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, Government is obliged to pay compensation to a workman employed by the contractor, in execution of the works, Government will recover from the contractor, the amount of the compensation so paid; and, without prejudice to the rights of the Government under sub-section (2) of Section 12, of the said Act, Government shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by Government to the contractor whether under this contract or otherwise. Government shall not be bound to contest any claim made against it under 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 Government might become liable in consequence of contesting such claim.

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

In every case in which by virtue of the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and of the contract labour (Regulation and Abolition) Central Rules, 1971, Government is obliged to pay any amounts of wages to a workman employed by the contractor in execution of the works, or to incur any expenditure in providing welfare and health amenities required to be provided under the above said Act and the Rules, under Clause 19 H or under the Contractor's Labour Regulations/ Act, or under the rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by Department of Atomic Energy contractors, Government will recover from the contractor the amount of wages so paid or the amount of expenditure so incurred; and without prejudice to the rights of the Government under Sub-Section (2) of Section 20, and Sub-Section (4) of Section 21, of the contract labour (Regulation and Abolition) Act, 1970, Government shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by Government to the contractor whether under this agreement or otherwise. Government shall not be bound to contest any claim made against it under Sub-Section (1) of Section 20, and 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 comply with provisions of the Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979.

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 14 YEARS

No labour below the age of fourteen years shall be employed on the work.

CLAUSE 19B: FAIR WAGE CLAUSE (PAYMENT OF WAGES)

Payment of wages:

i) The contractor shall pay to labour employed by him either directly or through sub contractors, wages not less than fair wages as defined in the DAE 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 contracts, the contractor shall comply with or cause to be complied with the DAE Contractor Labour Regulations made by Government from time to time in regard to payment of wages, wage period, deductions from wages, recovery of wages not paid and deductions unauthorisedly made, maintenance of wage books or wage slips, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and the Contract Labour (Regulation and Abolition) Central Rules 1971, wherever applicable.

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

iv-b) Under the provisions of the minimum wages (Central) Rules, 1950, the contractor is bound to allow the labourers directly or indirectly employed in the works one day's rest for six days continuous work and pay wages at the same rate as for duty. In the event of default, the Engineer-in-Charge shall have the right to deduct the sum or sums not paid on account of wages for weekly holidays to any labourers, 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 Benefit Act, 1961 and the Contractor's Labour (Regulation and Abolition) Act, 1970 or the modifications thereof or any other laws relating thereto and the rules made there under from time to time.

(vi) The contractor shall indemnify and keep indemnified Government against payments to be made under and for the observance of the laws aforesaid and the D.A.E. 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: SAFETY PROVISIONS FOR LABOUR & PENALTY ON DEFAULT.

In respect of all labour directly or indirectly employed in the work for the performance of the contractors part of this agreement,the contractor shall at his own expense arrange for the safety provisions as per BARC Safety Code framed from time to time and shall at his own expense provide

for all facilities in connection therewith. In case the contractor fails to make arrangements and provide necessary facilities as aforesaid, he shall be liable to pay a penalty of Rs. 200/-for each default and in addition the Engineer-in-Charge shall be at liberty to make arrangement and provide facilities as aforesaid and recover the costs incurred in that behalf from the contractor.

CLAUSE 19D: SUBMISSION OF LABOUR CHART BY EVERY FORTNIGHT

The contractor shall submit by the 4th and 19th of every month, to the Engineer-in-Charge, a true statement showing in respect of the second half of the preceding month and the first half of the current month respectively:-

1) the number of labourers employed by him on the work,
their working hours,
2) the wages paid to them,
3) 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
4) 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 Government, 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: HEALTH AND SANITATION ARRANGEMENT FOR WORKERS

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 NRB-BARC and its contractors.

CLAUSE 19F: MATERNITY BENEFIT RULES FOR FEMALE WORKERS EMPLOYED BY CONTRACTOR

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.

Appendix-I
REGISTER OF MATERNITY BENEFITS

(Clause 19 F of the conditions of contract)

Name and address of the contractor(s): ----------

Name and location of the work: ----------

Name of the employee	Father's / Husband's Name	Nature of employment	Period of actual appointment	Date on 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 Commenced	Delivery Ended	In case of Commenced	Mis-carriage Ended
6	7	8	9	10

Leave pay paid to the employee

In case of delivery			In case of mis-carriage	
Rate of leave pay	Amount paid	Rate of leave pay	Amount paid	Remarks
11	12	13	14	15

Appendix-II

SPECIMEN FORM OF THE REGISTER, REGARDING MATERNITY BENEFIT ADMISSIBLE TO THE CONTRACTOR'S LABOUR IN D.A.E. WORKS.

Name of the work: ----------

Name of the contractor: ----------

1. Name of the woman and her husband's Name:

2. Designation:

3. Date of appointment:

4. Date with months and years in which she is employed:

5. Date of discharge/dismissal, if any:

6. Date of production of certificates in respect of pregnancy:

7. Date on which the woman informs about the expected delivery:

8. Date of delivery/Miscarriage/death:

9. Date of production of certificate in respect of delivery/miscarriage:

10. Date with the amount of maternity / death benefit paid in advance of expected delivery

11. Date with the amount of subsequent payment of maternity benefit:

12. Name of the person nominated by the woman to receive the payment of the maternity benefit after her death:

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:

CLAUSE 19G: PENALTY FOR NON-COMPLIANCE OF LABOUR REGULATIONS

In the event of the contractor(s) committing a default or breach of any of the provisions of the 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 DAE 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 19H: PROVIDING HUTMENTS, W/S, S/I, DRAINAGE, SANITATIONS ETC FOR WORKERS.

The contractor(s) shall at his/their own cost provide his/their labour with a sufficient number of huts (hereinafter referred to as the camp) of the following specifications on a suitable plot of land to be approved by the Engineer-in-Charge.

(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.

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

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

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

(d) There shall be kept an open space of at least 7.2m (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.

(iii) 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 pipe lines for water supply to his/ their labour camp from the existing mains wherever available, and shall pay all fees and charges therefore.

(iv) The site selected for the camp shall be high ground, removed from jungle.

(v) 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.

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

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

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

CLAUSE 19I: REMOVAL OF INCOMPETENT WORKERS

The Engineer-in-Charge may require the contractor to dismiss or remove from the site of the work any person or persons in thecontractors' 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 19 J: NO PART OF BUILDING TO BE OCCUPIED - ACTION ON BREACH THEREOF

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

CLAUSE 19 K: 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 CPWD 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 19 L: Contribution of EPF and ESI

The ESI and EPF contributions on the part of employer in respect of this contract shall be paid by the contractor. These contributions on the part of the employer paid by the contractor shall be reimbursed by the Engineer-in-Charge to the contractor on actual basis.

The applicable and eligible amount of EPF&ESI shall be reimbursed preferably within 7 days but not later than 30 days of submission of documentary proof of payment provided same are in order.

CLAUSE 20: MINIMUM WAGES ACT TO BE COMPILED 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 SUB-LET. 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 anycomposition 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 President of India 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: SUMS PAYABLE BY WAY OF COMPENSATION

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

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

Except where otherwise provided in the contract, all questions and disputes 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 dealt with as mentioned hereinafter:

(i) If the contractor considers any work demanded of him to be outside the requirements of the contract, or disputes any drawings, record or decision given in writing by the Engineer-in-Charge or if the Engineer-in-Charge considers any act or decision of the contractor on any matter in connection with or arising out of the contract or carrying out of the work, to be unacceptable and is disputed, such party shall promptly within 15 days of the arising of the disputes request the Chief Executive, NRB who shall refer the disputes to Dispute Reressal Committee (DRC) within 15 days along with a list of disputes with amounts claimed if any in respect of each such dispute. The Dispute Redressal Committee (DRC) shall give the opposing party two weeks for a written response, and, give its decision within a period of 60 days extendable by 30 days by consent of both the parties from the receipt of reference from Chief Executive, NRB. The constitution of Dispute Redressal Committee (DRC) shall be as indicated in Schedule 'F'. Provided that no party shall be represented before the Dispute Redressal Committee by an advocate/legal counsel etc.

If the Dispute Redressal Committee (DRC) fails to give its decision within the aforesaid period or any party is dissatisfied with the decision of Dispute Redressal Committee (DRC) or expiry of time limit given above, then either party may within a period of 30 days from the receipt of the decision of Dispute Redressal Committee (DRC), give notice to the Chairman, NRB for appointment of arbitrator on prescribed proforma as per Appendix XV under intimation to the other party failing which they said decision shall be final binding and conclusive and not referable to adjudication by the arbitrator.

It is a term of contract that each party invoking arbitration must exhaust the aforesaid mechanism of settlement of claims/disputes prior to invoking arbitration. The Chief Executive NRB/Chairman NRB shall in such case appoint the sole arbitrator or one of the three arbitrators as the case may be within 30 days of receipt of such a request and refer such disputes to arbitration. Wherever the Arbitral Tribunal consists of three Arbitrators, the contractor shall appoint one arbitrator within 30 days of making request for arbitration or of receipt of request by Engineer-in-Charge to Chief Executive NRB/Chairman NRB for appointment of arbitrator, as the case may be, and two appointed arbitrators shall appoint the third arbitrator who shall act as the Presiding Arbitrator. In the event of

(a) A party fails to appoint the second Arbitrator, or

(b) The two appointed Arbitrators fail to appoint the Presiding Arbitrator, then The Chairman NRB shall appoint the second or Presiding Arbitrator as the case may be.

(ii) Disputes or difference shall be referred for adjudication through arbitration by a Tribunal having sole arbitrator where Tendered amount is Rs. 100 Crore or less. Where Tendered Value is more than Rs. 100 Crore, Tribunal shall consist of three Arbitrators as above.

The requirements of the Arbitration and Conciliation Act, 1996 (26 of 1996) and any further statutory modifications or re- enactment thereof and the rules made there under and for the time being in force shall be applicable.

It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed, if any, in respect of each such dispute along with the notice for appointment of arbitrator and giving reference to the decision of the DRC.

It is also a term of this contract that any member of the Arbitration Tribunal shall be a Graduate Engineer with experience in handling public works engineering contracts at a level not lower than Chief Engineer (Joint Secretary level of Government of India). This shall be treated as a mandatory qualification to be appointed as arbitrator. Parties, before or at the time of appointment of Arbitral Tribunal may agree in writing for fast track arbitration as per the Arbitration and Conciliation Act, 1996 (26 of 1996) as amended in 2015. Subject to provision in the Arbitration and Conciliation Act, 1996 (26 of 1996) as amended in 2015 whereby the counter claims if any can be directly filed before the arbitrator without any requirement of reference by the appointing authority, the arbitrator shall adjudicate on only such disputes as are referred to him by the appointing authority and give separate award against each dispute and claim referred to him and in all cases where the total amount of the claims by any party exceeds Rs. 1,00,000/-, the arbitrator shall give reasons for the award.

It is also a term of the contract that if any fees are payable to the arbitrator, these shall be paid as per the Act.

The place of arbitration shall be as mentioned in Schedule 'F'. In case there is no mention of place of arbitration, the arbitral tribunal shall determine the place of arbitration.

The venue of the arbitration shall be such place as may be fixed by the Arbitral Tribunal in consultation with both the parties. Failing any such agreement, then the Arbitral Tribunal shall decide the venue.

CLAUSE 26: CONTRACTOR TO INDEMNIFY GOVT. AGAINST PATENT RIGHTS

The contractor shall fully indemnify and keep indemnified the President of India against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claims made under or action brought against Government in respect of any such matters as aforesaid, the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expense, to settle any dispute or to conduct any litigation that may arise there from, provided that the contractor shall not be liable to indemnify the President of India 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 tems, 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: WITH HOLDING AND LIEN IN RESPECT OF SUMS DUE FROM CONTRACTOR

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

withhold and have a lien to retain to the extent of such claimed amount or amounts referred to above, from any sum or sums found payable or which may at any time thereafter become payable to the contractor under the same contract or any other contract with the Engineer-in-Charge of the Government or any contracting person through the Engineer-in-Charge pending finalization of adjudication of any such claim.

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

(ii) Government shall have the right to cause an audit and technical examination of the works and the final bills of the contractor including all supporting vouchers, abstract, etc., to be made after payment of the final bill and if as a result of such audit and technical examination any sum is found to have been overpaid in respect of any work done by the contractor under the contract or any work claimed to have been done by him under the contract and found not to have been executed, the contractor shall be liable to refund the amount of over-payment and it shall be lawful for Government to recover the same from him in the manner prescribed in sub-clause (i) of this clause or in any other manner legally permissible; and if it is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him under it, the amount of such under payment shall be duly paid by Government to the contractor, without any interest thereon whatsoever. Provided that the Government shall not be entitled to recover any sum overpaid, nor the contractor shall be entitled to payment of any sum paid short where such payment has been agreed upon between the Superintending Engineer or Executive Engineer on the one hand and the contractor on the other under any term of the contract permitting payment for work after assessment by the Project Director or the Engineer-in-Charge.

CLAUSE 29A: LIEN IN RESPECT OF CLAIMS IN OTHER CONTRACTS

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

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

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

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

Where ceiling price for imported labour has been fixed by State or Regional Labour Committees not more than that ceiling price shall be paid to the labour by the contractor. The contractor shall immediately remove any labourer who may be pointed out by the Engineer-in-Charge as being a coal mining or controlled area labourer. Failure to do so shall render the contractor liable to pay to Government a sum calculated at the rate of Rs.10/- per day per labourer. The certificate of the Engineer-in-Charge about the number of coal mining or controlled area labourer and the number of days for which they worked shall be final and binding upon all parties to this contract.

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

Explanation: - Controlled Area means the following areas:

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

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

CLAUSE 31: SUPPLY OF UNFILTERED WATER

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

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

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

CLAUSE 31A: DEPARTMENTAL WATER SUPPLY, IF AVAILABLE

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

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

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

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

CLAUSE 32: ALTERNATE WATER ARRANGEMENT.

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

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

CLAUSE 33: RETURN OF SURPLUS MATERIALS -ACTION TO BE TAKEN.

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

CLAUSE 34: HIRE OF PLANT AND MACHINERY

(i) The contractor shall arrange at his own expense all tools, plant, machinery and equipment (hereinafter referred to as T&P) required for execution of the work except for the Plant & Machinery listed in Schedule 'C' and stipulated for issue to the contractor. If the contractor requires any item of T&P on hire from the T&P available with the Government over and above the T&P stipulated for

issue, the Government will, if such item is available, to the contractor at rates to be agreed upon between him and the Engineer-in-Charge. In such a case, all the conditions hereunder for issue of T&P shall also be applicable to such T&P as is agreed to be issued.

(ii) Plant and Machinery when supplied on hire charges shown in Schedule 'C' shall be made over and taken back at the departmental equipment yard/shed shown in Schedule 'C' and the contractor shall bear the cost of carriage from the place of issue to the site of work and back. The contractor shall be responsible to return the plant and machinery with condition in which it was handed over to him, and he shall be responsible for all damage caused to the said plant and machinery at the site of work or elsewhere in operation and otherwise during transit including damage to or loss of plant and for all losses due to his failure to return the same soon after the completion of the work for which it was issued. The Divisional Engineer shall be the sole judge to determine the liability of the contractor and its extent in this regard and his decision shall be final and binding on the contractor.

(iii) The plant and machinery as stipulated above will be issued as and when available and if required by the contractor. The contractor shall arrange his programme of work according to the availability of the plant and machinery and no claim, whatsoever, will be entertained from him for any delay in supply by the Department.

(iv) The hire charges shall be recovered at the prescribed rates from and inclusive of the date the plant and machinery made over upto and inclusive of the date of the return in good order even though the same may not have been working for any cause except major breakdown due to no fault of the contractor or faulty use requiring more than three working days continuously (excluding intervening holidays and Sundays) for bringing the plant in order. The contractor shall immediately intimate in writing to the Engineer-in-Charge when any plant or machinery gets out of order requiring major repairs as aforesaid. The Engineer-in-Charge shall record the date and time of receipt of such intimation in the log sheet of the plant or machinery. Based on this, if the breakdown before lunch period or major breakdown will be computed considering half a day's breakdown on the day of complaint. If the breakdown occurs in the post lunch period of major breakdown will be computed starting from the next working day. In case of any dispute under this clause, the decision of the Superintending Engineer shall be final and binding on the contractor.

(v) The hire charges shown above are for each day of 8 hours (inclusive of the one hour lunch break) or part thereof.

(vi) Hire charges will include service of operating staff as required and also supply of lubricating oil and stores for cleaning purposes. Power fuel of approved type, firewood, kerosene oil etc. for running the plant and machinery and also the full time chowkidar for guarding the plant and machinery against any loss or damage shall be arranged by the contractor who shall be fully responsible for the safeguard and security of plant and machinery. The contractor shall on or before the supply of plant and machinery sign an agreement indemnifying the Department against any loss or damage caused to the plant and machinery either during transit or at site of work.

(vii) Ordinarily, no plant and machinery shall work for more than 8 hours a day inclusive of one hour lunch break. In case of an urgent work however, the Engineer-in-Charge may, at his discretion, allow the plant and machinery to be worked for more than normal period of 8 hours a day. In that case, the hourly hire charges for overtime to be borne by the contractor shall be 50% more than the normal proportionate hourly charges (1/8th of the daily charges) subject to a minimum of half day's normal charges on any particular day. For working out hire charges for over time, a period of half an hour and above will be charged as one hour and a period of less than half an hour will be ignored.

(viii) The contractor shall release the plant and machinery every seventh day for periodical servicing and/or wash out which may take about three to four hours or more. Hire charges for full day shall be recovered from the contractor for the day of servicing/ wash out irrespective of the period employed in servicing.

(ix) The plant and machinery once issued to the contractor shall not be returned by him on account of lack of arrangements of labour and materials, etc. on his part, the same will be returned only when they are required for major repairs or when in the opinion of the Engineer-in-Charge, the work or a portion of work for which the same was issued is completed.

(x) Log Book for recording the hours of daily work for each of the plant and machinery supplied to the contractor will be maintained by the Department and will be countersigned by the contractor or his authorized agent daily. In case the contractor contests the correctness of the entries and/or fails to sign the Log Book, the decision of the Engineer- in-Charge shall be final and binding on him. Hire charges will be calculated according to the entries in the Log Book and will be binding on the contractor. Recovery on account of hire charges for road rollers shall be made for the minimum number of days worked out on the assumption that a roller can consolidate per day and maximum quantity of materials or area surfacing as noted against each in the annexed statement (see attached annexure).

(ix) In the case of concrete mixers, the contractors shall arrange to get the hopper cleaned and the drum washed at the close of the work each day or each occasion.

(a) In case, rollers for consolidation are employed by the contractor himself, log book for such rollers shall be maintained in the same manner as is done in case of departmental rollers, maximum quantity of any items to be consolidated for each roller-day shall also be same as in Annexure to Clause 34(x). For less use of rollers, recovery for the less roller days shall be made at the stipulated issue rate.

(xii) The contractor shall be responsible to return the plant and machinery in the condition in which it was handed over to him and he shall be responsible for all damage caused to the said plant and machinery at the site of work or elsewhere in operation or otherwise or during transit including damage to or loss of parts, and for all losses due to his failure to return the same, soon after the completion of the work, for which it was issued. The Divisional Engineer shall be the sole judge to determine the liability of the contractor and its extent in this regard and his decision shall be final and binding on the contractor.

(xiii) The contractor will be exempted from levy of any hire charges for the number of days he is called upon in writing by the Engineer-in-Charge to suspend execution of the work, provided Government plant and machinery in question have, in fact, remained idle with the contractor because of the suspension

(xiv)In the event of the contractor not requiring any item of plant and machinery issued by Government though not stipulated for issue in Schedule 'C' any time after taking delivery at the place of issue, he may return it after two days written notice or at any time without notice if he agrees to pay hire charges for two additional days without, in any way, affecting the right of the Engineer-in-Charge to use the said plant and machinery during the said period of two days as he likes including hiring out to a third party.

CLAUSE 35: CONDITION RELATING TO USE OF ASPHALTIC MATERIALS

(i) The contractor undertakes to make arrangement for the supervision of the work by the firm supplying the tar or bitumen used.

(ii) The contractor shall collect the total quantity of tar or bitumen required for the work as per standard formula, before the process of painting is started and shall hypothecate it to the Engineer-in-Charge. If any bitumen or tar remains unused on completion of the work on account of lesser use of materials in actual execution for reasons other than authorized changes of specifications and abandonment of portion of work, a corresponding deduction equivalent to the cost of unused materials as determined by the Engineer-in-Charge shall be made and the material return to the contractors. Although the materials are hypothecated to Government, the contractor undertakes the responsibility for their proper watch, safe custody and protection against all risks. The materials shall not be removed from site of work without the consent of the Engineer-in-Charge in writing.

(iii) The contractor shall be responsible for rectifying defects noticed within a year from the date of completion of the work and the portion of the security deposit relating to asphaltic work shall be refunded after the expiry of this period.

CLAUSE 36: EMPLOYMENT OF TECHNICAL STAFF AND EMPLOYEES

Contractors Superintendence, Supervision, Technical Staff & Employees

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

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

All the provisions applicable to the principal technical representative under the Clause will also be applicable to other technical representative(s) The principal technical representative and other technical representative(s) shall be present at the site of work for supervision at all times when any construction activity is in progress and also present himself/themselves, as required, to the Engineer-in-Charge and/or his designated representative to take instructions. Instructions given to the principal technical representative or other technical representative(s) shall be deemed to have the same force as if these have been given to the contractor. The principal technical representative and other technical representative(s) shall be actually available at site fully during all stages of execution of work, during recording/checking/test checking of measurements of works and whenever so required by the Engineer-in-Charge and shall also note down instructions conveyed by the Engineer-in-Charge or his designated representative(s) in the site order book and shall affix

his/their signature in token of noting down the instructions and in token of acceptance of measurements/ checked measurements/ test checked measurements. The representative(s) shall not look after any other work. Substitutes, duly approved by Engineer-in-Charge of the work, in similar manner as aforesaid shall be provided in event of absence of any of the representative(s) by more than two days.

If the Engineer-in-Charge, whose decision in this respect is final and binding on the contractor, is convinced that no such technical representative(s) is/are effectively appointed or is/are effectively attending or fulfilling the provision of this clause, a recovery (non- refundable) shall be effected from the contractor as specified in Schedule 'F' and the decision of the Engineer-In-Charge as recorded in the site order book and measurement recorded checked/test checked in Measurement Books shall be final and binding on the contractor. Further if the contractor fails to appoint suitable technical Principal technical representative and/or other technical representative(s) and if such appointed persons are not effectively present or are absent by more than two days without duly approved substitute or do not discharge their responsibilities satisfactorily, the Engineer-in-Charge shall have full powers to suspend the execution of the work until such date as suitable other technical representative(s) is/are appointed and the contractor shall be held responsible for the delay so caused to the work. The contractor shall submit a certificate of employment of the technical representative(s) (in the form of copy of Form-16 or CPF deduction issued to the Engineers employed by him) along with every on account bill final bill and shall produce evidence if at any time so required by the Engineer-in-Charge.

(ii)The contractor shall provide and employ on the site only such technical assistants as are skilled and experienced in their respective fields and such foremen and supervisory staff as are competent to give proper supervision to the work.The contractor shall provide and employ skilled, semiskilled and unskilled labour as is necessary for proper and timely execution of the work.

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

CLAUSE 37: LEVY/TAXES PAYABLE BY CONTRACTOR.

(i) GST, Building and other Construction Workers Welfare Cess or any other tax, levy or Cess in respect of input for or output by this contract shall be payable by the contractor and Government shall not entertain any claim whatsoever in this respect except as provided under Clause 38.

(ii) The contractor shall deposit royalty and obtain necessary permit for supply of the red bajri, stone, kankar, etc. from local authorities.

(iii) If pursuant to or under any law, notification or order any royalty, cess or the like becomes payable by the 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 any tax, levy or cess applicable on last stipulated date of receipt of tender including extension if any. No adjustments i.e. increase or decrease shall be made for any variation in the rate of GST, Building and Other Construction Workers Welfare Cess or any tax, levy or cess applicable on inputs. However, effect of variation in rates of GST or Building and Other Construction Workers Welfare Cess or imposition or repeal of any other tax, levy or cess applicable on output of the works contract shall be adjusted on either-side, increase or decrease. Provided further that for Building and Other Construction Workers Welfare Cess or any tax (other than GST), levy or cess varied or imposed after the last date of receipt of tender including extension if any, any increase shall be reimbursed to the contractor only if the contractor necessarily and properly pays such increased amount of taxes/levies/cess. Provided further that such increase including GST shall not be made in the extended period of contract for which the contractor alone is responsible for delay as determined by authority for extension of time under Clause 5 in Schedule F.

(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 Divisional Officer on behalf of the President of India shall have the option of terminating the contract without compensation to the contractor.

CLAUSE 40: IF RELATIVE WORKING IN DAE, THEN CONTRACTOR NOT ALLOWED TO TENDER.

The contractor shall not be permitted to tender for works in the Nuclear Recycle Board (Responsible for award and execution of contracts) in which his near relative is posted as AO/AAO or as an Officer in any capacity between the grades of Engineer-in- Charge to Scientific Assistant (Both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Gazetted Officer in the Nuclear Recycle Board. Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of this Department.

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

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 ISSUED

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

(a) Quantity of cement & 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 Government to take action against the contractor under any other conditions of contract for not doing the work according to the prescribed specifications.

CLAUSE 43: COMPENSATION DURING WAR LIKE SITUATIONS

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

incorporation in the work being damaged or destroyed in consequence of hostilities or 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 Divisional Officer upto Rs.5,000/- and by the Superintending Engineer concerned for a higher amount. 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 Divisional Officer..

CLAUSE 44: APPRENTICES ACT -PROVISIONS TO BE COMPLIED WITH

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

CLAUSE 45: RELEASE OF SECURITY DEPOSIT AFTER LABOUR CLEARANCE

Release of Security Deposit of the work shall not be refunded till the contractor produces a clearance certificate from the Labour Officer. As soon as the work is virtually complete, the contractor 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.

III (3) - SAFETY CODE

Refer construction safety manual available at www.barc.gov.in website in addition to followings:

1) INTRODUCTION

Many of the works of Department of Atomic Energy as its various sites are expected by the contractors. During these work, contractor's personnel are likely to be exposed to different types of hazards. Similarly, unsafe acts of contractor's personnel may generate hazards for Departmental staff and/or workmen of other contractor are working at the site. Such unsafe acts may also pose danger to the existing installation and even to members of public. This guide is prepared to facilities safe working during execution of contract works. The safety measures given below are to be taken by the contractor during the executing of work. However, no claims on account of observing the additional safety precautions shall be entertained by the department. The intending tenderers are requested to quote their rates accordingly keeping in mind the safety guidelines.

2) GENERAL SAFETY PROVISIONS

2.1 The contractor shall take all safety precautions during the execution of awarded work and shall maintain and leave the site safe at all times. At the end of each working day and at all times when the work is temporarily suspended he shall ensure that all materials, equipment and facilities will not cause damage to existing property, personal injury or interference with the other works of the Project or Station. The contractors shall comply with all applicable provisions of the safety regulations cleanup programme and other measures that are in force at the site.

2.2 The contractor shall provide and maintain all lights, guards, fencing; warning signs caution boards and other safety measures and provide for vigilance as and where necessary or as required by the Engineer-in-Charge or by duly constituted authority for the protection of workers or for the safety of others. The caution boards shall also have appropriate symbols.

2.3 Adequate lighting facilities such as floodlights, hand area lighting shall be provided by the contractor at the site of work, storage area of material and equipment and temporary access roads within his working area. The contractor shall obtain written approval of the Engineer-in-charge to the lighting scheme and place of tapping prior to its installation.

2.4 The contractor shall plan his operations so as to avoid interference with the other departmental works, other contractors or sub-contractors at site. In case of any interference, the contractor shall seek necessary co-ordination from the department for safe and smooth working.

2.5 The contractor and his sub-contractor, is any shall comply with the instructions given by the Safety Engineer or his authorized nominee regarding safety precautions, protective measures, house keeping requirements, etc. The safety Engineer with due intimation to engineer-in-charge shall have the right to stop the work of the contractor, if in his opinion proceeding with the work will lead to an unsafe and dangerous condition. Engineer-in-charge shall get the unsafe condition removed or provide protective equipment at the contractors cost. The contractor can employ his own Safety Engineer for ensuring compliance of all safety rules. Contractor shall ensures that all his workmen are aware about the nature of risk involved in their work and have adequate training for carrying out their work safety.

2.6 The contractor shall be held responsible for non-compliance of any the safety measures and delays, implication, injuries, facilities and compensation arising out of such situations or incidents.

3. TRAFFIC

3.1 The contractors shall conduct his operations so as to interface as little as possible with the use of existing roads at near locations where the work is being performed.

3.2 When interface to traffic is inevitable, notice of such interference shall be given to the Engineer-in-charge well in advance (at least 48 hours) with the details of start of the work and time required, storage of material and details of the proposed methods of providing the required facilities for safe and continuous of roads and obtain his clearance.

3.3 The contractor shall at his own expense make such approved temporary provision as are required to maintain at least of traffic by bridging the excavation providing ramps over surface obstructions or providing suitable temporary bye-pass around the obstructions. The contractor shall exercise full acre ensure that no damage is caused by him or his workmen, during the operation to the existing water supply, sewerage, power or telecommunication lines or any other services or works. The contractor shall be required to provide and erect before construction, substantial barricades, guardrails, and warning signs. He shall furnish place and maintain adequate warning lights, signals, etc. as required by Engineer-in-charge.

4) SAFE MEANS OF ACCESS

4.1 Adequate and safe means of access and exist shall be provide for all work places, at all elevations. Using of scaffolding members (avoiding a ladder) for approach to high elevations shall not be permitted.

4.2 Suitable scaffolds shall be provide for workmen for all works that cannot safely be done from the ground, or from solid construction except such short duration work as can be done safely from ladders. Ladder shall be of rigid construction having sufficient strength for the intended load and made either of good quality wood or metal and all ladders shall be maintained well for safe working condition, and extra labourer shall be engaged for holding the ladder if ladder is not securely fixed. If the ladder is used for carrying material as well, suit able footholds and handholds shall be provided on the ladder. The ladder shall be given an inclination not steeper than 1 in 4 (1horizontal and 4 vertical). Ladders shall not be used for climbing carrying material in hands. While climbing both the hands shall be free.

4.3 Scaffolding or staging more than 3.5m above the ground or floor, swung or suspected from an overhead support or erected with or erected with stationery support shall have a standard guard rail properly attached bolted, braced or otherwise secured at least 1.0m high above the floor or platform of such scaffolding or staging. The guardrail shall extend along the entire exposed length of the scaffolding with only such opening as may be necessary for the delivery of material. Standard railing shall have posts not more 2m apart and an intermediate rail halfway between the floor or platform of the scaffolding and the top the rail. Such scaffolding or staging shall be so fastened as or prevent it from swaying from the building or structure Scaffolding and ladder shall conform to relevant IS specification IS specification (IS 3696-1966) Timber/Bamboo scaffolding shall not be used.

4.4 Working platforms of scaffolds shall have to boards at least 15cm in height to prevent material from failing down.

4.5 A sketch of the scaffolding proposed to be used shall be prepared and approval of the Engineer-in-charge before use.

4.6 Working platform, gangways and stairways shall be so constructed that they shall not sag unduly or unequally and if the height of the platform or gangway or stairway is more than 3.5m babove ground level or floor level, they shall be closely boarded, shall have adequate width for easy move.

4.7 The planks used for working platform shall not project beyond the end supports to a distance exceeding four times the thickness of the planks used. The planks shall be rigidly tied at both ends to prevent sliding and slippage. The thickness of the planks shall be adequate to take load of men and materials and shall not collapse.

4.8 Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent fall of persons or Material by providing suitable fencing or railing, the minimum height of which shall be 1.0m, along with 15cm high sheet of instruction at floor level along the railing.

4.9 Safe means of access shall be provided shall be provided to all working platforms and other elevated working places. Every ladder shall be securely fixed. No single portable ladder shall be over 9m in length. For ladder up to 3m in length the width between side rails in the ladder shall in no case be less than 300 mm For longer ladders this width shall be increased by at least 20 mm for each additional meter of length. Step spacing shall be uniform and shall not exceed 300 mm.

4.10 Adequate precautions shall be taken to prevent danger from electrical lines and equipment. No scaffolding, ladder, working platform runs, etc. shall exist within 3 meters of any uninstalled electric wire. Whenever electric power-and lighting cables are required to run through (Pass No) the scaffolding or electrical equipment are used, such scaffolding structures shall have minimum two earth connections with earth continuity **conforming to is code of** practice.

5 EXCAVATION, TRENCHING AND EARTH REMOVAL

5.1 All trenches 1.2m or more in depth shall at all times be supplied with at least one ladder for each spacing of 30m in length or fraction thereof. Ladder shall be extended from bottom of the trench to at least 1m above the surface of ground.

5.2 The sides of the trench, which are 1.2m or more in depth, shall be stepped back to give suitable slope (angle of response) or securely held by timber bracing, so as to avoid the danger of sides from collapsing. The excavated material shall not be place within 1.5m of the edges of the trench or half of the depth of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances mining or under-cutting shall be done.

5.3 The contractor shall ensure the stability and safety of the excavation, adjacent structures, services and the works.

5.4 Open excavation shall be fenced off by suitable railing and warning signals installed at right at well-lit places so as to prevent persons slipping or falling into the excavation.

5.5 All blasting operations shall be carried out on the basis of procedures approved by Inspector of Explosive. All works in this connection shall be carried out as per IS code of Practice. Barricades warning etc. shall be placed on the roads/open area. Prior approval of such operation shall be obtained from safety Engineer/Engineer-In-charge of works.

a) For removal of the earth from an earth mound a written permission shall be obtained from the Engineer-In-Charge of earth mound.

b) As far as partial earth shall be removed mechanically.

c) Wherever manual removal of earth is involved, earth shall be removed from the top by maintaining the proper slope equal to the angle of response of the earth.

d) Such work shall be contractor's responsible person and frequently inspected by the departmental representative to ensure that no under-cutting is done.

6. CONCRETING

Shuttering and supporting structures shall be of adequate strength and approved by Engineer-In-Charge. This shall be ensured before concrete is poured. The procedure approved by Engineer-In-Charge. This shall be ensured before concrete is poured. The procedure approved by Engineer-In-Charge shall be followed for missing, transporting and pouring of concrete.

7. DEMOLATION

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

(a) All roads and open area adjacent to the work site shall either be closed or suitably protected. Appropriate warning signs shall be displayed for cautioning approaching persons.

(b) Before demolition operation being, the contractor shall ensure that the power on all electric service lines is shut off and lines cut or disconnected at or outside the demolition site. If it is necessary to maintain electric power during demolition operation, the required services lines shall be adequately protected against damage. Person handling heavy materials/equipment shall wear safety shoes.

(a) No floor, roof or other part of the building shall be overload with debris or material as to render it unsafe.

(b) Entries to the demolition area shall be restricted to authorized persons only.

8. PERSONAL PROTECTIVE EQUIPMENT

All necessary personal protective equipment as considered necessary by the Engineer-in-Charge shall be kept available by contractor for the use of the persons employed on the site and maintained in a condition suitable for immediate use. Also the contractor shall take adequate steps to ensure proper use of equipment by those concerned. The personal protective equipment is to ensure proper use of equipment is to ensure proper use of equipment by those concerned. The personal protective equipment is to be provided by the contractor.

(a) All persons employed at the construction site shall use safety helmets, if advised by Safety Engineer/Engineer-in-charge.
(b) Workers employed on mixing asphalt materials, cement and lime mortar shall use protective goggles protective footwear and hand gloves. Use of proper respiration shall be an advantage.

(c) Persons engaged in welding and gas-cutting works shall use suitable welding face shields. The persons will assists the welders shall use suitable goggles protective goggles shall be wrong while chipping are grinding.

(d) Stone breakers shall use protective goggles. This shall be seated at sufficient safe interval distance.

(e) Persons engaged in or assisting in short ballistic operations and cleaning the blasting chamber shall use suitable gauntlets, overalls, dust-proof goggles, boot and protective hood supplied with fresh air at the minimum rate of 9m/hr.

(f) All persons working at heights more than 4.5m above ground or floor and exposed to risk of failing down shall use safety belts, unless otherwise protected by changes guard railing, etc. In place where the use of safety belts is impractical, suitable net of adequate strength fastened to substantial support shall be employed.

(g) All powered two-wheeler motor-cycle and inside manholes, which are in use, the contractors shall ensure that the manholes are opened and are equality ventilated at least for an hour. After it has been well ventilated the atmosphere inside the space shall be checked for the presence of any toxic gas or oxygen deficiency and recorded in the register before the workers are allowed to get into the manholes. The manholes opened shall be cordoned off with suitable railing and provided with

warning signals or caution boards to prevent accidents. There shall be proper illumination in the right.

9. PAINTING

9.1 The contractor shall not employ women on the work of painting with products con training lead in any form. Only men above the age of 18 years shall be employed on the work with lead paint. The following precautions shall be taken during the work.
Supplied air respirations shall be provided for use by the workers when paint is applied in the form of spray, or surface having leaded paint is dry rubbed or scraped. Overalls shall be supplied by the contractors to the workmen and adequate facilities shall be provided to enable the painters to wash at the cessation of work. All painting jobs, especially those in which leads paints are used shall be kept under Industrial hygiene surveillance.

9.2 Smoking, open flames or sources of ignition shall not be allowed in places where paints and other flammable substances are stored, mixed or used. A caution board with the instructions written in national/regional/regional language, "SMOKING-STRICTLY PROHIBITED" shall be displayed in the vicinity where painting is in progress or where paints are stored symbol shall also be used for caution boards.

Suitable fire extinguishers/stand buckets shall be kept available at places where flammable paints are stored handheld used.

When painting work is done in closed room or in as confined space adequate ventilation shall be provided. If adequate ventilation shall be provided workers shall wear suitable respirations.

9.3 Epoxy resins and their formulations used for painting shall not be allowed to come in contract with the skin. The workers shall use plastic gloves and/or suitable barrier creams.

Adequate ventilation shall be provided especially when working with not resin mixes. Increased personal hygiene shall be practiced to control inadvertent contract with the resin and eliminate its effects.

Workers shall thoroughly wash hands and feel before leaving the work. Work cloths shall be changed and laundered frequently.

10. LIFTING MACHINES AND TACKLES

10.1 Use of lifting machines and tackles including their attachment anchorage and supports shall conform to the following standards or conditions.

a) Lifting machines and tackles shall be of good mechanical construction should material and adequate strength and free from any defects and shall be kept in good repair and in good working order. Every rope used in hosting or lowering material or as a means of suspension shall be of good quality and adequate strength and free from any defect.

b) Every crane operation or lifting appliance operator shall be properly qualified. No person under the age of 21 years shall be in charge of any hosting machine or give signals to operator of such machine.

c) In case of every lifting machine (and of every chain, ring, hook, shackles, swivel and pulley blocked used in hoisting or as means of suspension the safe working load shall be working load shall be working load shall be ascertained and clearly marked. In case of a lifting machine having variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machinery any gear referred to above in load except for the purpose of testing this shall be approved by the Safety Engineer.

d) In case of departmental machines, the safe working load shall be notified by the Engineer-in-Charge. As regard contractor's machines the contractor shall notify the safe working load of the machine to the Engineer-in-Charge whenever he brings any machinery to site work and get it verified by Engineer-in-Charge, support by as valid test certificate by the competent person.

e) Thorough inspection and load testing of lifting machines and tackles shall be done by a component person at least once every 12 month and records of such inspection and testing shall be maintained.

10.2 Motors, gearing transmission, coupling, belts, chain drives and other moving parts of hosting appliances shall be provided with adequate safeguards, hosting appliances shall be provided with such means as will reduce to minimum the risk of any part of a suspended load becoming accidently displaced or lowered.

11. WELDING AND GAS CUTTING

11.1 Welding and gas cutting operations shall be done by qualified and authorized persons and as per IS specification and code of practice.
11.2 Welding and gas cutting not be carried out in places where flammable or combustible materials are kept and where is danger of explosion due to presence of gaseous mixtures.

11.3 Welding and gas cutting equipment including hoses and cables shall be maintained in good condition

11.4 Barriers shall be erected to protect other persons from harmful rays from the work. When welding or gas cutting is done in elevated positions precautions shall be taken to prevent sparks or hot metal failing on persons or flammable material.

11.5 Suitable type of protective clothing consisting of fire resistant gauntel gloves lieggings boots and aprons shall be provided to workers as protection from heat and hot metal splashes Welding shields with fiter glasses of appropriate shade shall be worn as face protection.

11.6 Adequate ventilation shall be provided while welding in confined space of while brazing cutting or welding zinc, brass bronze, galvanized or fead coated material.

11.7 Welding and gas cutting shall not be done on drums, barrel, tanks or other containers unless they have been empted, cleaned thoroughly and it is made certain that no flammable materials is present.

11.8 Fire extinguisher shall be available near the location of welding operation. Fire safety permit shall be obtained for working at vulnerable area and operating areas before flame cutting/welding is taken up.

11.9 For electric (Arc) welding the following additional safety precaution shall be taken

i) When electrical welding is undertaken near pipelines shall not be used as part of earth conductor but separate shall be connected to the machine directly from job.
ii) Personal contact with electrode or other live parts of electric welding equipment shall be avoided.
iii) Extreme caution shall be exercised to prevent accidental contact of electrodes with ground.
iv) The welding cable shall not be allowed to get entangled with power cables. Is shall be ensured that the cables are not damaged by movement of material.

12. GRINDING:

12.1 All portable grinders shall be used only with their wheel guard in position to reduce the danger from flying fragment should the wheel break during the use.
12.1 Grinding wheel of specified diameter only shall be used on a grinder-portable or
12.2 pedestal in order not to exceed the prescribed peripheral speed.
12.3 Goggles shall be used during operation.

13. ELECTRICITY:

Guidelines for providing temporary power supply at the site and general safety procedures for using electricity are given in the enclosed annexure.

14. HOUSE KEEPING:

14.1 The contractor shall at all times keep his work spot, site office and surrounding clean and tidy from rubbish, scrap, surplus material and unwanted tools and equipments.

14.2 Welding and other electrical cables shall be so routed as to allow safe traffic by all concerned.

14.3 No material on any sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The Engineer-In-Charge may require the contractor to remove any material, which is considered to be of danger or cause inconvenience to the public. If necessary, the Engineer-In-charge may cause them to be removed at the contractor's cost.
14.4 At the completion of the work, the contractor shall have removed from the work premises all scaffolding, surplus material, rubbish and all huts sanitary arrangements used/ installed for his workmen on the site.

14.5 The Engineer-In-Charge has the right to stop work if the contractor fails to improve upon the housekeeping after having been notified.

15. FIRE SAFETY:

All necessary precautions shall be taken on prevent outbreaks of fires at the construction site. Adequate provisions shall be made to extinguish fires should they still break out.
a) Quantities of combustible material like timber, bamboos, coal, paints etc. shall be the minimum required in order to avoid unnecessary accumulation of combustibles at site.

b) Containers of plant, thinners and allied material shall stored in a separate room which shall be well ventilated and free excessive heat, sparks, flame or direct rays of the sun. The containers of paint shall be kept covered pr properly fitted with lid and shall not be kept open except while using.
c) Fire extinguishers as approved by the Engineer-In-Charge shall be located at the construction site at appropriate places.

d) Adequate number of contract workmen shall be given education and training in fire extinguishing methods.

16. SAFETY WORK PERMIT:

16.1 In order to ensure of work for hazardous operation (such as entry into confined space, welding/cutting on equipment/pipes where explosion hazard is present works on high voltage and main medium voltage lines, blasting, etc.) special safety work permits (SWP) shall be raised. The SWP's shall be also to be obtained for any work as recommended by Safety Engineer.

16.2 The contractor shall strictly ensure all the safety conditions and requirements stipulated in the safety work permit. The work permit. The decision of the Safety Engineer shall be final in this regard.

17. WORK IN RADIATION AREA:

The contractor shall follow the stipulated procedure regarding work in the radiation area and other works related with radiography.

18. WORK IN AND AROUND WATER BODIES:

When the work is done near any place where there is risk of drawing, all necessary rescue equipment such as life buoys and life jackets shall provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision shall be made for prompt first-aid treatment of all injuries likely to be sustained during the course of the work. Persons who do not know swimming shall not be engaged along for any work where risk of drawing exists. Sufficient number of life buoys of life jackets shall be provided.

19. MEDICAL FACILITIES:

19.1 The contractor shall arrange adequate facilities for medical aid and treatment for his staff and workers engaged on the work site including the first-aid facilities if they are not available at the project.

19.2 First-aid appliances including sterilized dressing, cotton wool and antiseptic cream shall be made available at readily accessible places at every work site. These shall be maintained in good order under the charge of a responsible person.

19.3 As large work place where hospital facilities are not available within easy reach of the work, first-aid posts shall be established and be manned by a trained compo under. An ambulance shall be available during the entire period of work attending to injury cases.

20. SAFETY OFFICERS/SAFETY COORDINATOR:

The contractor shall have a Safety Officer or a supervisor to be designated as a safety coordinator in order to specifically look into the implemented of different safety requirement of the contractor work. The person thus designated will in general co-ordination with Engineer-In-Charge on matter of safety and in particular ensure that the Safety Guide is complied with fully. His name shall be displayed on the Notice Board at prominent place at the work site.

21. REPORTING OF ACCIDENT:

21.1 All accidents leading to property damage and/or personnel injuries shall be reported to the Engineer-in-charge immediately who shall inform SAROOP to be followed up with detailed accident reports in prescribed from.

21.2 Contractor shall also submit a monthly statement of accidents to Engineer-in-charge by 4th of every month showing details of accident, nature of injury including disability, days lost, treatment required, etc. and the extent of properly damage.

22. PUBLIC PROTECTION:

The contractor shall make all necessary provision to project the public. He shall be bound to bear the expenses for defence of every action or other processing at law that may be brought by any person for injury.

GUIDELINES AND GENERAL PROCEDURE FOR SUPPLY AND USE OF ELECTRICITY AT SITE

(A) GENERAL

1.1 Following safety requirements shall be complied with before the contractor uses the power supply.

1.2 It shall be the responsibility of the contractor to provide and maintain complete installation on the load side of the supply point with regard to safety requirements at site. All cabling and installation comply with the appropriate statutory requirements given below and shall be subject to approval of the Departmental Engineer-in-charge/ Electrical Engineer.

Indian Electricity Act, 1910
Electricity (Supply) Act, 1948
Indian Electricity Rules, 1956
National Electric Code, 1985
Other relevant rules of Local Bodies and Electricity Boards.

After installation of the electrical power wiring works by the contractor form of completion certificate as per IS 732 (form SGCW-1) shall be submitted by the contractor duly signed by the authorized valid license and/or supervisor along with one copy of the contractor's License and/or competency certificate of supervisor issued by the Electricity Board/Government Electricity Organization as per the enclosure.

The Power supply shall be regulated as per the terms and conditions of the supply of the respective electricity boards.

1.3 Tor purpose of electrical load and power planning by the electrical section, the contractor shall furnish along with the tender the estimated load requirement of electric power for the execution of the contract works in terms of maximum kilo watt or KVA demand during various periods/months of the contract period along with the details of the construction electrical equipment/machinery with their individual load details and location/locations of power supply required for availing temporary electric power supply in the standard Proforma enclosed (Form SGCW-2).

1.4 The electric power supply will be generally made available at one point in the works site of the contractor by the department.

1.5 Where distribution boards are located at different places the contractor shall submit schematic drawing indicating all details like size of wires, overhead or cable feeder, earthing, etc. The position and location of all equipments and switches shall be given.

1.6 The contractor shall make his own arrangements for main earth electrodes and tappings thereof. The existing earth points available at site can be used at the discretion of the Departmental Electrical Engineer with prior permission. Method of earthing installation and earth testing results shall conform to relevant I.S. specification (IS-3043).

1.7 All there phase equipment shall be provided with double earthing. All light fixtures and portable equipment shall be effectively earthed to main earthing.

All earth terminals shall be visible. No gas popes and water pipes shall be used for earth connection. Neutral conductor shall not be treated as earth wire. The contractor shall not connect any additional power required, test reports of the tests mentioned in (d) of form SGCW-1 shall be submitted.

1.8 Joints in rating conductors shall be avoided loop earthing of equipments shall not be allowed. However trapping form an earth bus may be done.

The test procedure and their results shall conform to relevant IS specification. The contractor shall submit a test report for his complete installation every 2 months or after rectifying any faculty section in the specimen test report. One such test report for the complete installation shall be submitted before onset of monsoon.

1.9 Electrical power supply at Medium voltage (415 volt, 3 phases, and 4 wires) for constructional purpose and general lighting will be made available at site or near site of work at the discretion of Engineer-in-charge at one point. The distance will not however, exceed 50 meters from the building site. The contractor has to lay the power lines from this point at his own cost in an approved manner as indicated in subsequent clauses. The power supply will be made available subject to following:

1.10 The contractor should submit a list of equipments he proposed to connect for constructional and general lighting purposes indicating his power requirements in appropriate form enclosed (Annexure-I) for approval of Engineer-in-charge. A list of licensed electrical staff he will be posting at site.

1.11 The contractor should pay the minimum charges based on his power demands at Current tariff rates prevailing at site as charged by supply authorities and as shown in schedule 'A' (Schedule of Materials to be supplied).

1.12 Suitably rated KWH meter will be supplied and installed by contractor and test certificates as per ISS from authorised test lab or manufacturer is submitted.

1.13 All extension from this point shall be executed in an approved manner with prior permission of Electrical Engineer. The installation shall conform to Indian Electricity Rules, Indian Electricity Act 1910 & IRE Regulations as per the latest Revisions and got executed by Licensed Electrical Contractors only.

1.14 The entire installation shall be subject to the following tests before energisation of installation including portable equipments.

a) Insulation resistance test
b) Polarity test of switches
c) Earth continuity test
d) Earth electrode resistance

The testing procedure and results shall conform to ISS & Code of practice. The contractor shall provide the necessary skilled and unskilled labour and also instruments for conducting the test. The tests shall be carried out in the presence of Electrical Engineer and submitted in proforma enclosed (Annexure-II).

1.15 Double grounding will be provided for all equipments. Power supply will be affected after completion of above.

(B) AFTER ENERGISING THE INSTALLATION CONTINUITY OF POWER SUPPLY WILL BE SUBJECT TO THE FOLLOWING:

i) The contractor shall submit a test report as per Clause (A) (vii) a, b, c, d for his complete installation every 2 months or after rectifying any faulty section in the specimen test report enclosed (Annexure II). One such test report for the complete installation shall be submitted before onset of monsoon.

ii) The contractor should not connect any additional load without prior permission of Electrical Engineer. For obtaining additional power required, test reports should be submitted.

iii) Where distribution boards are located at different places, the contractor shall submit schematic drawing indicating all details like size of wires, OH or cable feeders, earthings etc.

iv) The supply will be switched off by the Elec. Engineer by prior arrangement with Dept. for normal and preventive maintenance etc., of Departmental equipments once in a month. The duration and time will be intimated to contractor. The availability of power supply will be further subject to shut down due to any emergency break downs or switch off by supply authorities for their maintenance works. Contractor is not eligible for any compensation due to above. Government will not be liable for any loss or damage to the contractor's equipment as a result of variations in voltage or frequency of interruptions in power supply. In the event of any failure / interruptions /stoppage of power supply for a continuous period not exceeding 24 hours the contractor shall have no claim whatsoever against Government. For any power failure / stoppage resulting in interruptions for a continuous period exceeding 24 hours, the contractor will be eligible only for reasonable extension of time for any compensation in this account. Government will not be liable for any loss to the contractor arising from failure or interruption or stoppage of works any attendant delays consequent upon such failure, interruption or stoppage of power supply or variations in voltage or frequency.

(C) THE FOLLOWING ARE PROVIDED FOR GENERAL GUIDANCE OF THE CONTRACTOR AND SHOULD BE READ AS SPECIFIC REQUIREMENTS, IN ADDITION TO COMPLYING WITH INDIAN ELECTRICITY ACT, INDIAN ELECTRICITY RULES, I.S. REGULATIONS.

i) The minimum clearance to be maintained for all overhead line shall be 4 meters along roads and 6.1 meters across roads.

ii) Wherever cables or wires are laid on poles a guard wire of adequate size shall be run along the cables/wires and earthed effectively.

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

iv) All loose hanging of wire and cables should be avoided and should be properly supported and an approved method of fixing shall be adopted.

v) Installation shall not cause any hindrances to movement of men and materials.

vi) Reinforcement rods or any metallic part of structures should not be used for supporting wires and cables fixtures, equipments etc.

vii) All cables and wires should be adequately protected mechanically against damages.

viii) In case the cable is required to be laid in ground, it should be adequately protected by covering the same with bricks, PCC title or any other approved means.

ix) Laying of cables and wires direct on floor shall be avoided but if, required the same shall be taken through G.I. / M.S. pipes etc.

(D) i) All the switch boards, equipments etc. should be protected from rain and should not be exposed to weather. The contractor should provide proper enclosure of approved size and shape for protection against rain.

ii) As far as possible, switch fuse units and Distribution Boxes etc. with HRC fuses should be used.

iii) The switch fuse units should be checked for their proper function. As far as possible new equipments should be used. However, the same shall be in a very good condition. ISI marked equipments from reputed manufacturers will be preferred. Switch fuse units of appropriate ratings of fuse be utilised for the required power supply and all terminals in the external supply should, as far as possible, be taken from the bottom of the switch such that rain water or its spray will not enter the switch boards from the top. All switches of the switch boards should have proper gaskets so that no water will enter even if rain water or its spray falls on the switches.

iv) All the Distribution Boards, Switch fuse units, Bus bar chambers etc. shall be dust and vermin proof. The distribution boards, switches etc. shall be so fixed that they should be easily accessible. The position and location of all equipments, switches etc. shall be informed to the Electrical Engineer at the time of energisation. Also, the same should be informed as soon as any change is done.

(E) i) Only PVC insulated & PVC sheeted wires or armoured PVC insulated and sheeted cables should be used for external power supply connections of temporary nature. Weather proof rubber wire should not be used for any temporary power supply connections. Taped joints in the wires shall be avoided as far as possible and the connections shall be made in looping system. At the terminal points of the switch boards,

an effective PVC Box or alternatively M.S. Box, with proper glands and sealing arrangements, should be provided to ensure that no moisture leaks at the terms of the switches.

ii) All armoured cables shall be properly terminated by using suitable cable glands, standard conductor cables shall be connected by using cable lugs / sockets, Cable lugs should preferably be crimped, cable lugs should be proper size and should correspond to the current rating and size of the cables. Twisted connections will not be allowed.
iii) All the cables glands shall be properly earthed.

iv) All connections to lighting fixtures, starters or other power supply should be provided with PVC insulated, PVC sheeted twin core wires to have better mechanical protection for preventing possible damage to equipment or injury to personnel. No taped joints will be allowed and the connections may be looping system.

v} All the lighting fixtures and lamp holders shall be of good quality and in good condition. Badly repaired or broken holders etc. will not be allowed for use.

vi} The working areas shall be adequately lighted. The lighting fixtures shall be fixed in such a manner such that sufficient head clearance is provided for general working.

vii} For day to day lighting requirements it is preferred that an extension board is used for three pin plugs should be used for tapping. By using the extension boards any number of light points can be tapped as and when required, without having any joints in wires.

viii) The connection for portable machines shall be taken through 3 pin plugs points, Iron clad industrial type plug outlets are preferred. While taking supply through plug outlet a plug top must be used. The third pin of the plug shall invariably be earthed and 3 core wires shall be used.

ix} Wire guards shall be provided on bulbs as far as possible.

(F) (i) Method of earthing, installation and size of earth electrodes and earthing conductors and earth testing results shall conform to relevant I.S. etc.

ii) Generally the contractor shall make his own arrangements for main electrode and taping thereof. The existing earth points available at site can be used at the discretion of the Electrical Engineer with prior permission.

iii} Joints in earthing conductor shall be avoided as far as possible. However in case of a joint it should be properly soldered or jointed in an approved manner. Twisting of wires will not be allowed. Loop earthing of equipment shall not be allowed. However, tappings from on earth bus may be done. Every equipment should be provided with two independent earth connections except for portable equipments.

iv) All three phase equipments shall be provided with duplicate earthing./ All light fixtures and portable equipments should be effectively earthed to main earthing.

(G) POWER SUPPLY TO ALL THE MACHINES AND LIGHTING FIXTURES ETC. SHALL BE SWITCHED OFF WHEN NOT IN USE.

i) Persons having valid wireman's license / competency certificate must be employed for carrying out electrical work and repair of equipments, installation and maintenance at site. A qualified /licensed supervisor may also be employed for supervision.

ii) An electric power failure and/or accident caused due to noncompliance of above mentioned instructions will entirely be the responsibility of the contractor.

iii) On recommendations by the Electrical Engineer the Engineer-in-charge reserves the right to disconnect the power supply to the contractor without prior intimation. If the above mentioned instructions are not Followed contractor will not be eligible for any compensation due to such disconnections.

SAFETY INSTRUCTIONS: ELECTRICAL OPERATIONS

I. INSTALLATION

1. Only Persons having valid wireman‘s licence /competency certificate shall be employed for carrying out electrical work and repair of electrical equipment, installation and maintenance at site. The job shall be supervised by a qualified licensed supervisor.

2. Electrical equipment and installation shall be installed and maintained as to prevent danger from contract with live conductors and to prevent fires originating from electrical causes like short circuit, overheating, etc. Installation shall not cause any hindrance to movement of men material.

3. Material for all electrical equipment shall be selected with regard to working voltage, load and working environment. Such equipment shall conform to the relevant standards.

4. The minimum clearance to be maintained for all overheads lines alone and across roads shall be as per the statutory requirements as listed in clause 1.2 Annexure.

5. Grounding conductor of wiring system shall be copper or other corrosion-resistant material. An extra grounding connection shall be made in appliances/equipment where chances of electric shock are high.

6. Electric fuses and/or circuit breakers installed in equipment circuits for short circuit protection shall be of proper rating. It is also recommended that high rupturing capacity (HRC) fuses be used in all circuits. For load of 5KW or more earth leakage circuit breaker shall be provided in the circuits.

7. Wherever cables or wire laid on poles, a guard wire of adequate size shall be run along the cables/wires and earthed effectively. Metallic poles as a general rule shall be avoided and if used shall be earthed individually. Ant climbing guard's notices shall be provided on poles. Each equipment shall have individual isolating swathes.

8. Wire and cables shall be properly of fixing shall be adopted. Loose hanging of wires and cables shall be avoided. Lighting and circuits shall be kept distinct and separate.

9. Reinforcement roads or any metallic part of structure shall not be used for supporting wires and cables, fixtures, equipment, earthing, etc.

10. All cables and wires shall be adequately protected mechanically against damages. In case the cable is required to be laid underground, it shall be adequately protected by covering the same with bricks, plain cement concrete (PCC) tile or any other approved means.

11. All armcured cables shall be properly terminated by using suitable cable gland Multithreaded conductor cables shall be connected by using cables lugs/socket cables lugs shall preferably be crimped. They shall be of proper size and shall and shall correspond to the current rating and size of cable. Twisted connection will not be allowed.

12. All cables gland, armouring and sheathing of electric cables, metal circuits and their fitting, metallic fitting and other non-current carrying parts of electrical equipment and apparatus shall be effectively grounded.

13. All the Distribution Boards, switch use units, Bus bar chambers, etc. shall have MS enclosures and shall be free from dust, vermin and water. The Distribution Boards switches etc., shall be so fixed that they shall be easily accessible. Changes shall be done only after the approval of the Departmental Electrical Engineer.

14. The Contractor shall Provided proper enclosures/ cover of approved size and shape for Protection of all the switchboard, equipment etc. against rain. Exposed live part of all electrical circuits and equipment shall be enclosed permanently. Crane trolley wires and other conductors, which cannot be completely insulated shall be placed such that they are inaccessible under normally working conditions insulated shall be placed such that they are inaccessible under normal working conditions.

15. Ironclad industrial type plug outlets are preferred for additional safety.

16. Open type distribution Boards shall be placed only in dry and ventilated rooms; they shall not be placed in the vicinity of storage batteries or otherwise exposed to chemical fumes.

17. Isolating switches shall be provided close to equipment for easy disconnection or electrical equipment or conductors from the source of supply when repair or maintenance work has to be done on them.

18. In front of distribution boards a clear apace of 90 cm shall be maintained in order to have easy access during an emergency.

19. Adequate working spaces shall be provided around electrical equipment which required adjustment or examination during operation.

20. As far as possible switches shall be excluded from a place where there is danger of explosion. All electrical equipment such as motors, switches and lighting fittings installed in workroom where there is possibility of explosion hazards shall be explosion proof.

21. All connection to lighting fixtures, started or other power supplies shall be provided with PVC insulated twin/three/four core wires to have better mechanical protection for preventing possible damage to equipment or injury to personnel. Taped joints shall not be allowed and the connections may be made in looping system. Electric starter or motors, switches shall not be mounted on wooden boards. Only sheet steel mounting or iron frame work shall be used.

22. All the lighting fixtures and lamp holders shall be of good quality and in good condition. Badly repaired or broken holder, etc, shall not be used.

23. Only PVC insulated and PVC sheathed wires or armoured PVC insulated and sheathed cables shall be used for external power supply connection of temporary nature. Weather proof tuber wires shall not be used for any temporary power supply connections. Taped joints in the wires shall not be used.

24. The bulbs/lamps used for illumination and testing purpose shall have cover or guard to protect them from accidental breakages. Only 24 V supply system shall be used for hand lamps etc, while working inside metallic tanks or conducting vessels.

25. After installation of new electrical system and or other extensive alterations to existing installation, through inspection shall be made by Departmental Electrical Engineer before the system or new extension is put in use.

26. Contractor shall ensure that power factor for their loads shall be main trained at 0.85. in case the power factor falls below 0.85, necessary capacitor units shall be provided by the contractor.

Electrical equipment and installations should be so designed, installed and maintained at to prevent danger from contact with live conductors and / or from electrically originated fire. Only qualified/licensed persons should be permitted to install, adjust, examine on repair electric equipment/circuits.

27. Materials for all electrical equipment should sealed with regard to working voltage, load and working environment, such equipment should conform to the relevant standards. Exposed live parts at electrical circuits and equipment operating with alternating current (AC) at 50 volts or more should be generally provided with permanent enclosures / cover. Crane trolley wires and other conductors, which cannot be completely insulated, should be placed such that they are inaccessible under normal working conditions.

28. Armouring and sheathing of electric cables, metal circuits and their fittings, metallic fittings and other non-current carrying parts of electrical equipment and apparatus should be effectively grounded. Grounding conductor of wiring system should be copper or other corrosion resistant material. An extra grounding connection should be made in appliances / equipments where chances of electric shock are high.

29. Electric fuses and / or circuit breakers installed in equipment circuits for short circuit protection should be of proper rating. It is also recommended that high rapture capacity (HRC) fuses should be used wherever possible in circuits carrying currents more than 15 amps. Open type distribution boards should be placed only in dry and ventilated rooms, they should not be placed in the vicinity of storage batteries in otherwise exposed to chemicals fumes.

30. Isolating switches should be provided for disconnecting electrical equipment or conductors from the source of supply when repair or maintenance work has to be done on them. As far as possible electrical switches should be excluded from a place where there is danger of explosion. All electrical equipments such as motors, switches and lighting installed in work room where there is possibility of explosion hazard should be explosion proof type approved by CMRS, Dhanbad.

II) OPERATION & MAINTENANCE:

i) A person who works with electrical installation / equipment should be aware of the electrical hazards, use of protective devices and safe operational procedures. They should be given training in fire fighting, first aid and artificial resuscitation techniques.

ii) The supervisor should instruct in the proper procedure, specify and enforce the use of necessary protective equipment such as adequately insulated pliers, screw drivers, fuse pullers and similar hand tools. Only wooden ladders should be used to reach the heights in electrical work. No material or earth work shall be allowed to be dumped or in the vicinity of the bare overhead lines conductors.

iii) Before any maintenance work is commenced on electrical installation / equipment the circuits should be de-energised and ascertained to be dead by positive test with an approved voltage testing device. Switches should be tagged or the fuse holders withdrawn before starting the work.

iv) Adequate precautions should be taken in two important aspects
a) That there shall be no danger from any adjacent live part and
b) That there shall be no chances of re-energisation of the equipment on which the persons are working.

v) While working or near a circuit, whenever possible the use of only one hand should be practised even though the circuit is supposed to be dead. The other hand may preferably be kept in pocket.
vi) When it is necessary to touch electrical equipment (for example when checking for overload or motors) back of the hand may be used. Thus, if accidental shock were to cause muscular contractions, one should not 'freeze' to the conductor.
vii) Operation of electrical equipment should be avoided when standing on wet floor or when hands are wet.
viii) Before blown fuses are replaced, the circuit, should be locked out and investigations should be made for the cause of the short-circuit or overload.
ix) Pliers, screw drivers, testing lights and other tools for the work should be adequately insulated for voltage involved.
x) When two persons are working within reach of each other, they should never work on different phases of the supply.
xi) When structural repairs, modification or painting works are undertaken, appropriate measures should be taken for the protection of persons where work may bring them into the proximity of live equipment I circuit.
xii) Temporary electrical connections should be removed as soon as the stipulated work is over.
xiii) An insulation resistance test should be carried out every time equipment is connected back after alterations or repair. Also, insulation resistance tests (meggar tests) should be made periodically and significantly low readings or sudden changes should be carefully investigated. Outside installations which are exposed to weather should be tested more frequently.
xiv) It should be ensured that no extension boards are over loaded while tapping. Only standard three pin plugs should be used for tapping electricity. Broken sockets I plugs should be replaced

immediately with good ones. Joint free cables only should be used for connecting equipment I apparatus.

xv) Floors should be kept free from tailing electrical cables to avoid tripping hazard.

III) PORTABLE ELECTRICAL EQUIPMENT

i) Portable electrical equipment should be regularly examined, tested and maintained to ensure that the equipment and its loads are in good order.

ii) All portable appliances should be provided with a three pin plugs. It should be ensured that the metal part of the equipment should be effectively earthed.

iii) BARE WIRE SHOULD NOT BE USED FOR TAPPING ELECTRICITY

a) It should be ensured that the insulation and wire size of extension cords are adequate for the voltage and current to be carried.

b) All loose wiring such as trailing and flexible cables for portable lamps, tools and apparatus should be regularly examined.

IV. GENERAL SAFETY PROCEDURE

1. It should be ensured that power supply to equipment is disconnected before any repair work is undertaken. Insulated tools shall be used for working on electrical equipment's. At building constructional sites, helmets and safety shoes shall be used.
2. In case of an accident the security staff on duty shall be informed immediately. Also the Engineer-in-charge, Electrical Engineer, Safety Co-ordinator of the Project. Administrative Officer of the Project and Tarapur / Tarapur dispensary shall be informed.
3. In case of an electrical accident a report should also' be sent to the Electrical Inspector, on prescribed proforma, under intimation to the Electrical Engineer and the Engineer-in-charge. Also, resuscitator may be used.
4. In case of fire hazard, BARC **Fire Brigade (Phone No. 63101/65101/66101)** shall also be informed immediately. For Tarapur works the Security Officer, Tarapur shall be contacted through Assistant Security Officer, PREFRE.
5. The contractor shall keep a first aid kit at site. However, in case of accident major/Serious) the victim shall be taken to BARC, Tarapur Dispensary before removing from the premises, **(Dispensary Phone No. 63199/65199).** For Tarapur works the victim shall be taken to TAPS Hospital at Tarapur.
6. In case of working at a high elevation either safety belts shall be used or railing / enclosure shall be provided around the working platform / Cage / ladder etc.
7. Ropes, shackles, chains, slings etc. to be used (especially for use of tying the scaffolding etc.) shall be periodically checked for integrity and mechanical soundness and corrected by replacement. All safety procedures and practices as informed by Department should be followed.

Annexure – I

(Claim A (ii))

(Under Clause 15)

FORM OF REQUISITION FOR SUPPLY OF ENERGY

To

_____,

_____.

Sir,

I/We, require power supply at 415V, 3 Phase 4 wire for our installation at the following Location for a period of _____ year/months.

Location of the Project: _____

The installation shall be executed by the following Electricity Contractor:

Name of the Contractor: _____

License No. & Grade "_____

The detail of the proposed layout is as follows:

Description H.P./KW Type of Starting Single Phase or 3 Phase Meters

(i)

(ii)

(iii)

Other Plants.

Lighting Layouts

Lights at office, stores etc.

Ceiling fans.

Heaters :

Socket 54 x 5 ph.,154 x 5 p.h.

Outdoor Lights :

Number and Wattage.

3. We propose to install overhead lines with bare conductors/double P.V.C. insulated wires/underground cables. Brief details to be given (wires type of pole Brief details to be given (wires type of pole to be used etc. in case of underground cables – Tupe & Number of joints.

We shall be providing the earthing layout as follows :

(a) Type of each electrode : Plate/pipe coiled earth

(b) Materials : Copper/G.I.

(c) No. of electrodes & Location :

(d) Min. size of earth conductor on OH layout & bearer wires :

(e) Any other relevant details :

4. Total maximum demand for our layout will not exceed _____KW/KVA.

5. We shall be providing our own KWH meter and test certificate for the KWH meter will be submitted before effecting power supply.

6. We agree to pay towards electricity bill during the calendar months for consumption of energy on unit basis at rates indicated or minimum charges on the connected load whichever is higher.

7. The installation shall be executed conforming to I.S. Code of practice and Indian Electricity Rules with their latest revision.

8. We shall be submitting required test reports in proforma enclosed every month and before on set of monsoon.

9. We shall maintain our installation in good repair and conform to all statutory regulations of Central/State Government and also as pet safety regulations that will be intimated by the Department from time to time at our own cost and risk. We have also read the guide lines to temporary supply of Department and agree to abide by them.

Signature of the Contractor

Annexure – II

(Claim A (vii) & B (I))

Under Clause 15.

TEMPORARY POWER SUPPLY

DETAILS AND TEST REPORTS

Ref No. : _____ Date: _____

Name of the contractor: _____

Address: _____

_____

Name of the Licensed

Electrical Contractor/: _____

Supervisor:_____

_____

I/We hereby certify that the installation detailed below has been installed by me/us and tested and that to the best of my/our knowledge and belief, it complied with Indian Electricity Rules, 1956.

Electrical Installation at _____

Voltage and system of supply_____

1. Particulars of works:

(a) Internal Electrical Installations:

No. of Load Type of system of writing

(i) Light point

(ii) Fan Point

(iii) Plug point

a) 3 Pin 5 Amp.

b) 3 Pin 15 Amp.

c) Others.

	Description	HP/KW	Type of Starting	Single Phase/ Three Phase
a) Motors	(i)			
	(ii)			
	(iii)			

b) Other plants.

c) If the work involves installation of overhead line and/or underground cables:

a) i) Type and description of overhead lines.

ii) Total length and No. of Spans.

b) i) Total length of underground cable and its size.

ii) No. joints End joint

Tee joint

St. through joints.

NOTE: All outdoor lines should be of doubly installed lines and wires should conform to IS 3035.

II. Earthing:

i) Description of earthing electrode.

ii) No. of earth electrodes.

iii) State of main earth load.

(ii) Main control switch _____mps _____ Vlts. _____PH_____N

(ii) Energy meter details Sr.No _____make_____

_____ph_____wire

(_____230)

_____250V

_____Rev/kwh

Initial reading on the Meter _____on_____

(iii) Meter test certificate attached: Yes/No.

(iv) Test results.

a) Insulating Resistance

i) Insulation resistance of the whole system of conductors to earth _____megaohms.

ii) Insulation resistance between the phase conductor and neutral.

Between Phase R and neutral _____ megaohms

Between Phase Y and neutral _____ megaphms

Between Phase B and neutral _____ megaohms.

iii) Insulation resistance between the phase conductors in case of polyphase supply.

Between phase R and Phase Y _____ megaphms.

Between phase Y and Phase B _____ megaohms.

Between phase B and Phase A _____megaohms.

iv) Insulation resistance of motor/other plants.

S.No. Equipment Capacity I.A. Test Result

_____

_____

b) Earth continuity test Maximum resistance between any point in the earth continuity conductor including metal conducts and main earthing lead.

_____ohms.

c) Earth electrode resistance

Resistance of each earth electrode.

i) _____ohms.

ii) _____ohms

iii) _____ohms

iv) _____ohms

d) Name and signature of License wireman who will operate and maintain Contractor's installations : _____

License No. _____

Signature of Electrical Supervisor/Contractor
License No. & Class

Signature of the Contractor
Name & Address:

FORM NO. SGCW - 1

FORMAT FOR ELECTRICITY SUPPLY

I/We certify that the installation detailed below has been installed by me/us and tested and that do the best of my /our knowledge and belief, it complies with Indian electricity Rules, 1956 as well as IS: 732-1968 code of practice for Electrical Writing Installation (System Voltage)not exceeding 650 volts (Revised).

Electric installation at.....

Voltage and system of supply.....

A)

Sr. No	Particular of work	Number of load	Total of wiring	Total wiring
1	Lights Points			
2	Fan Points			
3	Plug Points			
4	Motors			

B) If the work involves installation of overhead lines and/or underground cable.....

C) Earthing:
- i) Description of earthing electrode:
- ii) Size of earth wire:
- iii) Number of electrode provide

D) Test results:

1) Insulation resistance for the whole installation:

Between conductors

Between each conductor and earth

2) Resistance of earthing electrodes or earthing system

3) Maximum earthing resistance of installation.....

Signature of Supervisor
Name& Address of Supervisor

Signature of Contractor
Name & address of Contractor

FORM NO. SGCW – 1

'A' APPLICATION FORSERVICE CONNECTION BY CONTRACTOR

(To be filled in Triplicate)

1. Name & Address of Contractor:
2. Reference to Tender & Work Order:
3. Completion Period
4. Connection load details

   (Please attach details in a separate sheet)
5. Max. Demand anticipated:
6. Nature of service connection requires:

   (Whether single or three phase)
7. Place where service required:
   - a) Works:
   - b) Colony:
8. If supply of electricity is free or chargeable:

   (Please: Enclosed extra of conditions from the tender)
9. Details of meter provided:
   - a) If meter required from the department:

     Whether SD is paid
   - b) Details of SD (Security Deposit)
   - c) Whether meter is tested or not:

     if tested, attach the test report, if not, Details of testing fee deposited
10. Name of Supervisor/ Electrical-in-charge of installation and maintenance
11. Electrical license No. of person Mentioned against col. 10
12. Electrical safety appliances available for use

13. First Aid facility box available For use, if any

(Signature of the Contractor)
Name:
Date:

'B' CERTIFICATE BY THE SAFETY ENGINEER

Certified that my/our installation have been carried out in accordance with I.E. Rules and that I/We have employed competent persons to handle the installations
I/We am /are agreeable to the bills, in respect of this service connections beings raised on the basis the connected load furnished above, in case the actual consumption falls below the stipulated by tender conditions

(Signature of the Contractor)
Name:
Date:

'C' CERTIFICATE BY THE CONTROL ENGINEER

Verified the particulars and forwarded to the Engineer-in-charge

(Signature of the Contract Control Engineers)
Name:
Section Civil/Electrical/Mechanical
Date:

'D' CERTIFICATE BY THE ENGINEER-IN-CHARGE

Certified that the particulars furnished by the Contractor are used to the best of my knowledge and belief and that I have satisfied myself as the safe conditions of electrical installations for which the service connection is applied.

Signature:
Name:
Designation with Section:
Date:

'E' CERTIFICETE BY THE SAFETY ENGINEER

Certified that I have inspected the electrical installation referred herein and after satisfying myself about the safe conditions of the installation, I hereby recommend that the service connection be given to the contractor.

(Signature of the Safety Engineer)
Name:
Date:

'F' AUTHORISATION BY THE ELECTRICAL ENGINEER

Service connection may be/may not be given for the reasons notice here under.

(Signature of Electrical Engineer)
Name:

Date:
Designation:

'G'REPORT OF COMPLIANCE

Service connection is given by me on

a) Meter Nos: 1).....
2).....
3).....

a) Initial readings:
1).....
2).....
3).....

c) Location
1).....
2).....
3).....

d) Meter sealing:
1).....
2).....
3).....

Signature of Electrical Engineer
(Metering and Billing)
Name
Date: Designation:

Note:
(G) Filled up by the Electrical Engineer after power supply is given
Copy to contract Control Engineer

After all the formalities are completed and Report of compliance
Copy to Safety Engineer
Copy to Electrical Engineer

III (4) - MODEL RULES

1. **APPLICATION** These rules shall apply to all building and construction works in charge of NRB,BARC,Tarapur, Department of Atomic Energy in which twenty or more workers are ordinarily employed or are proposed to be employed on 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 or are proposed to be 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 ground and shall contain the following equipment, namely:—
(a) For work places in which the number of contract labour employed does not exceed 50 each first-aid box shall contain the following equipments:

1. 6 small sterilised dressings.
2. 3 medium size sterilised dressings.
3. 3 large size sterilised dressings.
4. 3 large sterilised 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 snake-bite lancet.
8. 1 (30 gms.) bottles 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 numbers of contract labour exceeds 50. Each first-aid box shall contain the following equipments:
1. 12 small sterilised dressings.
2. 6 medium size sterilised dressings.
3. 6 large size sterilised dressings.
4. 6 large size sterilised burn dressings.
5. 6 (15 gms.) packets sterilised cotton wool.
6. 1 (60 ml.) bottle containing a two per cent alcoholic solution of iodine.
7. 1 (60 ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.
8. 1 rolls 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 institute, 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 recoupment 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 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 of 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 persons suddenly taken ill to the nearest hospital.

4. DRINKING WATER

(i) In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.
(ii) Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.

(iii) Every water supply of storage shall be at a distance of not less than 50 feet from any latrine, drain or other source of pollution. Where water has to be drawn from an existing well which is within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with a trap-door which shall be dust and water proof.
(iv) A reliable pump shall be fitted to each covered well, the trap-door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

5. WASHING FACILITIES

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

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

6. LATRINES AND URINALS

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

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

(b) Where males are employed, there shall be at least one latrine for every 25 males. Provided that where the number of males or females exceeds 100, it shall be sufficient if there is one latrine for 25 males or females, as the case may be, up to the first 100, and one for every 50 thereafter.
(ii) Every latrine shall be under cover and so partitioned off as to secure privacy and shall have a proper door and fastening.
(iii) **Construction of latrines:** The inside walls shall be constructed of masonry or some suitable heat resisting non-absorbent materials and shall be cement washed inside and outside at least once a year. Latrines shall not be of a standard lower than bore-hole system.
(iv) (a) Where workers of both sexes are employed, there shall be displayed 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 up to 50 and one for female workers up to 50 employed at a time. Provided that where the number of male or female workmen, as the case may be, exceeds 500, it shall be sufficient if there is one urinal for every 50 males or females up to the first 500 and one for every 100 or part thereof, thereafter.
(vi) (a) The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.
(b) Latrines and urinals other than those connected with a flush sewerage system shall comply with the requirements of the Public Health Authorities.
(vii) Water shall be provided by means of a tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.
(viii) Disposal of excreta: Unless otherwise arranged for by the local sanitary authority, arrangements for proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator. Alternately excreta may be disposed 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 into manure).
(ix) The contractor shall, at his own expense, carry out all instructions issued to him by the Engineer-in-Charge to effect proper disposal of soil and other conservancy work in respect of the contractor’s workmen or employees on the site. The contractor shall be responsible for payment of any charges which may be levied by Municipal or Cantonment Authority for execution of such work on his behalf.

7. PROVISION OF SHELTER DURING REST

At every place there shall be provided, free of cost, four suitable sheds, two for meal, 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 meters from the floor level to the lowest part of the roof. These shall be kept clean and the space provided shall be on the basis of 0.6 Sq.m. per head.

8. CRECHES

(i) At every work place at which 20 or more women workers are ordinarily employed, there shall be provided two rooms of reasonable dimensions for the use of their children under the age of

six years. One room shall be used as a play room for the children and the other as their bed-room. The rooms shall be constructed on a standard not lower than the following.
a) Thatched roof.
b) Mud floors and walls.
c) Planks spread over the mud floor and covered with matting.
(ii) The rooms shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean.
(iii) The contractor shall supply adequate number of toys and games in the play rooms and sufficient number of cots and beddings in the bed room.
(iv) The contractor shall provide one Dai to look after the children in the creche when the number of women workers does not exceed 50 and two Dais when the number of women workers exceeds 50.
(v) The use of the rooms earmarked as creches shall be restricted to children, their attendants and mothers of the children.

9. CANTEENS

(i) In every work place where the work regarding the employment of contract labour is likely to continue for six months and wherein contract labour numbering one hundred or more are ordinarily employed, an adequate canteen shall be provided by the contractor for the use of such contract labour.
(ii) The canteen shall be maintained by the contractor in an efficient manner.
(iii) The canteen shall consist of at least a dining hall, kitchen, store room, pantry and washing places separately for workers and utensils.
(iv) The canteen shall be sufficiently lighted at all times when any person has access to it.
(v) The floor shall be made of smooth and impervious material and inside walls shall be lime washed or colour washed at least once in each year: Provided that the inside walls of the kitchen shall be lime washed every four months.
(vi) The premises of the canteen shall be maintained in a clean and sanitary condition.
(vii) Waste water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause a nuisance.
(viii) Suitable arrangement shall be made for the collection and disposal of garbage.
(ix) The dining hall shall accommodate at a time 30 per cent of the contractor labour working at a time.
(x) The floor area of the dining hall, excluding the area occupied by the service counter and any furniture except tables and chairs shall not be less than one square meter per diner to be accommodated as prescribed in sub-rule (ix).
(xi) (a) A portion of the dining hall and service counter shall be partitioned off and reserved for women workers, in proportion to their number.
(b) Washing places for women shall be separate and screened to secure privacy.
(xii) Sufficient tables, stools, chairs or benches shall be available for the number of diners to be accommodated as prescribed in sub-rule (ix).
(xiii)(a) (1) there shall be provided and maintained sufficient utensils, crockery, furniture and any other equipments necessary for the efficient running of the canteen.
(2) The furniture, utensils and other equipments shall be maintained in a clean and hygienic condition.
(b) (1) Suitable clean clothes for the employees serving in the canteen shall be provided and maintained.
(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 food stuffs and other articles served in the canteen, the following items shall not be taken into consideration as expenditure, namely:—
(a) The rent of land and buildings;
(b) The depreciation and maintenance charges for the building and equipments provided for the canteen;
(c) The cost of purchase, repairs and replacement of equipments including furniture, crockery, cutlery and utensils;
(d) The water charges and other charges incurred for lighting and ventilation;
(e) The interest and amounts spent on the provision and maintenance and equipments provided for in 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 rule shall be incorporated in the contracts and notices inviting tenders and shall form an integral part of the contract.

12. AMENDMENTS

Government may, from time to time, add to or amend these rules and issue such directions as it may consider necessary for the purpose of removing any difficulty which may rise in the administration thereof.

III (5) - CONTRACTORS LABOUR REGULATIONS

1. Short Title: These regulations may be called the "Department of Atomic Energy "Contractors Labour Regulations".

2. Definitions:

i) "Workman" means any person employed by the Department of Atomic Energy or its Contractor directly or indirectly through a sub-contractor, with or without the knowledge of the Department of Atomic Energy, to do any skilled, semi-skilled or unskilled manual, supervisory, technical or clerical work for hire or reward, whether the terms of employment are expressed or implied but does not include any person –

a) Who is employed mainly in a managerial or administrative capacity; or

b)Who, being employed in a supervisory capacity draws wages exceeding five hundred rupees per mensem or exercise either by the nature of the duties attached to the office or by reason of powers vested in him, functions mainly of managerial nature;

c) Who is an out worker, that is to say, a person to whom any article or materials are given out by or on behalf of the principal employer to be made up, cleaned, washed, altered, ornamental finished, repaired, adopted or otherwise processed for sale for the purposes of the trade or business of the principal employer and the process is to be carried out either in the home of the out worker or in some other premises, not being premises under the Control and management of the principal employer.

ii) "Fair Wages" means wages whether for time or piece work fixed and notified under the provisions of the Minimum Wages Act from time to time.

iii) "Contractors" shall include every person who undertakes to produce a given result other than a mere supply of goods or articles of manufacture through contract labour or who supplies contract labour for any work and includes a sub-contractor.

iv) "Wages" shall have the same meaning as defined in the payment of wages act.

3) (i) Normally working hours of an adult employee should not exceed 9 hours a day and in case of a child 41/2 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. Children shall not be made to work extra hours.

(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 a 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 over time rate.

4. Display of Notice regarding wages etc.:

The contractor shall before he commences his work on contract, display and correctly maintain and continue to display and correctly maintain in a clean and legible condition in conspicuous places on the work, notices in English and in the local Indian languages spoken by the majority of the workers, giving the minimum rates of wages fixed under the Minimum Wages Act, the actual wages being paid, the hours of work for which such wages are earned, wage periods, dates of payment of wages and other relevant information as per ***Annexure - A.***

5. Payment of Wages:

(i) The contractor shall fix wage periods in respect of which wages shall be payable.

(ii) No wage period shall exceed one month.

(iii) The wages of every person employed as contract labour in an establishment or by a contractor where less than one thousand, such persons are employed shall be paid before the expiry of the seventh day and in other cases before the expiry of tenth day after the last day of the wage period in respect of which the wages are payable.

(iv) Where the employment of any worker is terminated by or on behalf of the contractor, the wages earned by him shall be paid before the expiry of the second working day from the date on which his employment is terminated.

(v) All payments of wages shall be made on a working day at the work premises and during the working time and on a date notified in advance and in case the work is completed before the expiry of the wage period, final payment shall be made within 48 hours of the last working day.

(vi) Wages due to every worker shall be paid to him direct or to other person authorised by him in this behalf.
(vii) All wages shall be paid in current coin or currency or in both.

(viii) Wages shall be paid without any deductions of any kind except those specified by the Central Government by general or special order in this behalf or permissible under the payment of Wages Act, 1956.
(ix) A notice showing the wages period and the place and time of disbursement of wages shall be displayed at the place of work and a copy sent by the contractor to the Engineer-in-Charge under acknowledgement.
(x) It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the Engineer-in-Charge or any other authorised representative of the Engineer-in-Charge who will be required to be present at the place and time of disbursement of wages by the contractor to workmen.

(xi) The contractor shall obtain from the Engineer-in-Charge or any other authorised representative of the Engineer-in-Charge as the case may be, a certificate under his signature at the end of the entries in the "Register of wages" or the "Wage-cum-Muster Roll" as the case may be in the following form : "Certified that the amount shown in column No. _____ has been paid to the workmen concerned in my presence on _____ at _____

6. Fines and deductions which may be made from wages:

i) The wages of a worker shall be paid to him without any deductions of any kind except the following:
a) Fines.

b) Deductions for absence from duty i.e from the place or the places where by the terms of him employment he is required to work. The amount of deduction shall be in proportion to the period for which he was absent.

c) Deductions for damage to or loss of goods expressly entrusted to the employed person for custody, or for loss of money or any other deduction which he is required to account, where such damage or loss is directly attributable to his neglect or default.

d) Deduction for recovery of advances or for adjustment of over payment of wages, advances granted shall be entered in a register.

e) Any other deduction which the Central Government may from time to time allow.
ii) No fines should be imposed on any worker save in respect of such acts and omissions on his part as have been approved of by the Chief Labour Commissioner.
Note: An approved list of acts and omissions for which fines can be imposed is enclosed as ***Annexure - I***.

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 anyone 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 installment, or after the expiry of sixty days from the date on which it was imposed.

vi) Every fine shall be deemed to have imposed on the day of the act or omission in respect of which it was imposed.

7. Labour Records:

i) **Register of persons employed :** The contractor shall maintain a "Register of persons employed" on work on contract in Form XIII of the CL (R & A) Central Rules, 1971 (***Annexure - B***).
ii) **Muster Roll** : The contractor shall maintain "Muster Roll" in respect of all workmen employed by him on the work under the contract in form XVI of the CL (R & A) Rules, 1971 (***Annexure - C***).
iii) **Wage Register:** The contractor shall maintain "Wage Register" in respect of all workmen employed by him on the work under the contract in form XVII of the CL (R & A) Rules, 1971 (***Annexure - D***).

iv) **Register of accidents:** The Contractor shall maintain a register of accident in such form as may be convenient at the work place but the same shall include the following particulars:

a) Full particulars of the labourers who met with accident.
b) Rate of wages.
c) Sex.
d) Age.
e) Nature of accident and cause of accident.
f) Time and date of accident.
g) Date and time when admitted in Hospital.
h) Date of discharge from Hospital.
i) Period of treatment and result of treatment.
j) Percentage of loss 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) **Register of Fines:** The contractor shall maintain a **"Register of Fines"** in the form XII of the CL (R & A) Rules, 1971 (***Annexure - H***).
vi) **Register of deductions for damage or loss: The** contractor shall maintain a **"Register of deductions for damage or loss"** in the form XX of the CL (R & A) Rules, 1971 (***Annexure - J***).
vii) **Register of Advances:** The contractor shall maintain a **"Register of Advances"** in the form XXI of the CL (R&A) Rules, 1971 (***Annexure - K***)
viii) **Register of overtime:** The contractor shall maintain a **"Register of Overtime"** in the form XXIII of the CL (R & A Rules, 1971 (***Annexure - L***).

8. Attendance Card-cum-Wage slips:

i) The contractor shall issue an **attendance card-cum-wage** slip to each workmen employed by him in the specimen format (***Annexure - E***).
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 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 (***Annexure-F***).

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 (***Annexure - G***).
11. Preservation of Labour Records: All records to be maintained under Regulations Nos. 6 and 7 shall be reserved 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, Labour Officer or any other officers authorised by the Department of Works & Housing in this behalf.

12. Power of Labour Officers to make investigations or enquiry: The Labour Officer or any other person authorised by Central Government on their behalf shall have power to make enquiries with a view to ascertaining and enforcing due and proper observance of the Fair Wages Clauses and the Provisions of Regulations. He shall investigate into any complaint regarding the default made by the contractor or sub contractor in regard to such provision.

13. Report of Labour Officer : The Labour Officer or other person authorised as aforesaid shall submit a report of result of his investigation or enquiry to the Engineer-in-Charge concerned indicating the extent, if any to which the default has been committed with a note that necessary deductions from the contractor's bill be made and the wages and other dues be paid to the labourers concerned in case an appeal is made by the contractor under Clause 13 of these regulations, actual payment to labourers will be made by the Engineer-in-Charge after the Chief Engineer has given his decision on such appeal. a) The Engineer-in -Charge shall arrange payments to the labour concerned within 45 days from the receipt of the report from the Labour Officer or the Chief Engineer as the case may be.

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

15. Prohibition regarding representation through 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 referred to in clause (a) is affiliated.
c) Where the employer is not member of any registered trade union, by an officer of a trade union, connected with, 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 employees to which association referred to in clause (a) is affiliated.
c) Where the employer is not a member of any association of employers, by an officer of association of employer, connected with, 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 regulations.

16. Inspection of Books and slips : The contractor shall allow inspection of all the prescribed labour records to any of his workers or to his agent at a convenient time and place after due notice is received or to the Labour Officer or any other person, authorised by the Central Government on his behalf.

17. Submission of returns: The contractor shall submit periodical returns as may be specified from time to time.

18. Amendments: The Central Government may from time to time, add to or amend the regulations and any question as to the application, interpretation or effect of these regulations the decision of the Chief Engineer concerned in that behalf shall be final.

III (6) - PERFORMA OF REGISTER

ANNEXURE- A

LABOUR BOARD

Name of work _____

Name of contractor_____

Address of contractor _____

Name and address of Division _____

Name and address of Labour Officer _____

Name and address of Labour Enforcement Officer _____ _____

Date _____

Sr. No.	Category	Minimum wage fixed	Actual wage paid	Number present	Remarks

Weekly holiday _____

Wage period _____

Date of payment of wages _____

Working Hours _____

Rest Interval ----------

ANNEXURE-B

Form XIII

REGISTER OF WORKMEN EMPLOYED

Sr. No.	Name and Surname of Workmen	Age And Sex	Father's/ Husband's Name	Nature of Employment/ designation	Permanent Home address of the workmen (village, Ta, & District)	Local Address	Date of commencement of employment	Signature of thumb impression of the workman	Date of Termination of employment	Reason for Terminati on	Remark
1	2	3	4	5	6	7	8	9	10	11	12

ANNEXURE – C

FORM XVI

MUSTER ROLL

Name and address of contractor:

Name and address of establishment in/under which contract is carried on:

Nature and location of work:

Name and address of Principal Employer:

For the month of/fortnight:

Sl No.	Name of Workman	Father's/Husband Name	Sex	Date					Remark
1	2	3	4	5					6
				1	2	3	4	5	

ANNEXURE- D

FORM XVII

REGISTER OF WAGES

Name and address of contractor:

Name and address of establishment in/under which contract is carried on:

Nature and location of work:

Name and address of Principal employer:

Wage period: Monthly/Fortnightly

SI NO	Name of Workman	Serial No. in the register of workmen	Designation/ nature of Work Done	No. of Days worked	Units of Work done	Daily Rate of wages/ piece rate	Amount of Wages Earned						Net Amount Paid	Signature of thumb impression of the workman	Initial of contractor or His Repetitive
							Basic Wages	Dearness Allowance	Overtime	Other cash Payment (nature of Payment to be Indicated)	Total	Deductions if any (Indicate Nature)			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

ANNEXURE-E

WAGE CARD

Wage Card No.:

Name and address of contractor:

Date of issue :

Name of work with location:

Name of workman:

Rate of wages :

Date of issue :_____ Designation_____ Month/fortnight_____

1. 2. 3. 4. 5 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21.22. 23. 24. 25. 26. 27 28 29. 30. 31
Morning: Rate: Rate: Evening: Amount: Amount: Initial:

Recivedfrom_____the sum of Rs._____on account of my wages

The wage card is valid for one month from date of issue. Signature

FORM XIX

WAGE SLIP

Name and address of contractor: _____

Name and Fathers/Husbands name of workman: _____

Nature and location of work: _____

For the Week/Fortnight/Month ending: _____

1. No. of days worked: _____

2. No. of units worked in case of piece: _____ rate workers

3. Rate of daily wages/piece rate: _____

4. Amount of overtime wages: _____

5. Gross wages payable: _____

6. Deductions, if any: _____

7. Net amount of wages paid _____

Initials of the contractor or his representativ

ANNEXURE F

FORM XIV

EMPLOYMENT CARD

Name and address of contractor: _____

Name and address of establishment in/under: _____ _____ which contract is carried on

Name of work and location of work: _____

Name and address of Principal employer: _____

1. Name of the workman: _____

2. Sl. No. in the register of workman: _____ 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

ANNEXURE G

FORM - XV

SERVICE CERTIFICATE

Name and address of contractor:

Name and address of establishment in/under which contract is carried on

Name and location of work:

Name and address of workman

Name and address of principle employer

Age or Date of birth

Identification marks

Father / husband's Name

SI NO	Total Period for which employed		Nature of Work Done	Rate of wages (With particulars of Unit in case of Piece Work)	Remarks
	From	To			
1	2	3	4	5	6

ANNEXURE - H

FORM - XII

REGISTER OF FINES

Name and address of contractor:

Name and address of establishment in/under which contract is carried on:

Nature and location of work:

Name and address of Principal employer:

WAGES PERIOD: MONTHLY /FORTNIGHTLY

Sr. No.	Name of Workmen	Father's/ Husband's Name	Designation/ nature of work done	Act/omissi-on for which fine imposed	Date of offence	Whether workmen showed cause against fine	Name of person in whose presence explanation was heard	Wage period and wages payable	Amount of fine imposed	Date on Which fine realised	Remark
1	2	3	4	5	6	7	8	9	10	11	12

ANNEXURE - I

LIST OF ACTS AND OMISSIONS FOR WHICH FINES CAN BE IMPOSED:

In accordance with rule 5 of the Department of Atomic Energy Contractor's Labour

Regulations to be displayed prominently at the site of work in both English and local language.

1. Wilful 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 Department of Atomic Energy.

3. Taking or giving bribes or any illegal gratifications.

4. Habitual late attendance.

5. Drunkenness fighting, riotous or disorderly or indifferent behaviour.

6. Habitual negligence.

7. Smoking near or around the area where combustible or other materials are locked.

8. Habitual indiscipline.

9. Causing damage to work in the progress or to property of the Department of Atomic Energy

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. Unauthorized use of employer's property for manufacture or making of unauthorized articles at the work place.

15. Bad workmanship in construction and maintenance by skilled workers which is not approved by the Department and for which the contractors are compelled to undertake rectifications.

16. Making false complaints and/or misleading statements.

17. Engaging on trade within the premises of the establishments.

18. Any unauthorized divulgence of business affairs of the employees.

19. Collection or canvassing for the collection of any money within the premises of an establishment unless authorized by the employer.

20. Holding meeting inside the premises without previous sanction of the employers.

21. Threatening or intimidating any workman or employee during the working hours within the premises.

ANNEXURE - J

FORM - XX

REGISTER OF DEDUCTIONS FOR DAMAGE OR LOSS

Name and address of contractor:

Name & address of establishment in/under which contract is carried On

Nature and location of work:

Name and address of Principal Employer:

Sr. No.	Name of Workmen	Father's/ Husband's Name	Designation/ nature of work emoly-ment	Particulars of damage or loss	Date of damage or loss	Whether workmen showed cause against deduction	Name of person in whose presence explanation was heard	Amount of deductio nimpose d	No. of Instalme nts	Date of Recovery		Re-mark
										First Instalme nt	Last Instalme nt	
1	2	3	4	5	6	7	8	9	10	11	12	13

ANNEXURE - K

FORM - XXII

REGISTER OF ADVANCES

Name and address of contractor:

Name & address of establishment in/under which contract is carried on

Nature and location of work

Name and address of Principal Employer:

Sr. No.	Name of Workmen	Father's/ Husband's Name	Designation/ nature of employment	Wage period and wages payable	Date and amount of advance given	Purpose(s) for which advance made	No. of Installments by which advance to be repaid	Date and amount of each installment repaid	Date on which last installment was repaid	Remark
1	2	3	4	5	6	7	8	9	10	11

ANNEXURE - L

FORM - XXIII

REGISTER OF OVERTIME

Name and address of contractor

Name and address of establishment in/under which contract is carried on:

Nature and location of work:

Name and address of Principal Employer:

Sr. No.	Name of Workmen	Father's/ Husband's Name	sex	Designation/ nature of employment	Dates on which overtime worked	Total overtime worked or production in case of piece rated	Normal Rate of Wages	Overtime rate of wages	Overtime earnigs	Rate on which overtime wages paid	Remark
1	2	3	4	5	6	7	8	9	10	11	12

ANNEXURE - M

PROFORMA FOR HINDRANCE REGISTER

REF: Para 28/11/01 CPWD Works Manual

Sr. No.	Nature of Hindrance	Item of works which could not be executed on account of the hindrance	Date of start of Hindrance	Date of removal of Hindrance	Over Lapping period if any	Net Hindrance in days	Signature of Eng.-In-Charge	Weightage of this Hindrance	Net effective Days of Hindrance	Sign of PD	Remarks of Reviewing officer
1	2	3	4	5	6	7	8	9	10	11	12

GOVERNMENT OF INDIA

BHABHA ATOMIC RESEARCH CENTRE

Nuclear Recycle Board, Tarapur

(SECTION – IV)

SPEIAL CONDITIONS TO CONTRACTS

IV (1) - SPECIAL INSTRUCTIONS TO TENDERERS

1. GENERAL

These special conditions supplement the General Conditions of Contract and shall be considered as part of the contract document. Where these special instructions are at variance with the corresponding conditions, stipulations, and specifications else wherein the tender document, these special instructions shall prevail. **Unless mentioned otherwise, the rates quoted by the contractor shall include the cost likely to be incurred by him to comply with the requirements stipulated in this section.**

2. SCOPE OF WORK

Name of work: - "Supply, Installation, Testing, Commissioning and Training of CCTV & lighting System".

Location:- The proposed site of work is located at BARC Complex Tarapur, Boisar which is about 14 Kms away from Boisar railway station (Western Railway).The site is also approachable from Mumbai - Ahmadabad national highway.

Scope of Work: - The scope of work is described in Section-V, Technical Specifications and Section VIII, Schedule of Quantities and Rates.

General:-

1. The contractor will have to make their own arrangement for labour camp away from the campus. The department will not provide any land for the same.
2. Water & Electricity will be supplied as per Schedule 'B'
3. Security regulations:

   Please refer to the details with respect to Security Regulations at Tarapur as attached separately.

   Please note that the tenderer should taken into account all the requirements as detailed above and their tendered cost shall be deemed to include fully the above stipulations and no extraneous claims whatsoever shall be entertained by the Department on this account.

3. LAYOUT

The contractor shall layout his work from base lines in grids established by NRB and shall be responsible for all measurement and survey work in connection therewith. The contractor shall at his own expenses furnish all stakes, templates, platforms, equipment, arrange labour that may be required in setting or laying out any part of the work. The contractor shall be held responsible for proper execution of the work to such lines and grades as may be established or indicated in the drawings and specifications. The contractor shall take benchmarks, lines and levels. The contractor is to construct and maintain proper benches at the intersections of all main walls, columns, etc. in order that the lines and levels may be accurately checked at all times, theodolite, levels, prismatic compass, chain, steel and metallic tapes and all other surveying instruments found necessary for the work shall be provided by the contractors for use at site in connection with this work.

3A. DRAINAGE IN THE VICINITY OF THE BUILDING

The contractor shall be entirely responsible for the provision and maintenance of the efficient drainage arrangements in the work site to lead of all water whatever pumped from the excavation or on account of rains, springs or any other sources whatsoever. Flooding or bonding of water in the work site shall not be permitted under any circumstances whatsoever and the contractor shall take all precautions to prevent the same by providing suitable pump or other dewatering arrangements. The cost of repairing damages, if any, to the work under execution or to any Government property in and around the site shall be entirely borne by the contractor when such damages are due to noncompliance with the above conditions

3B. COMMENCEMENT AND COMPLETION OF WORK IN PROPER SCHEDULE

The entire work shall be completed within a period of (as specified in NIT/ Schedule F) months including monsoon period from fifteenth day from the date on of written order to commence the work. Time being the essence of the contract, a broad based time schedule showing the important phases of the work has been prepared by the Department for contractor's information and enclosed herewith. It will be necessary for the contractor to adhere to this program of work and he will have to prepare and submit detailed program of work and showing the various activities of work taking into consideration the departmental program. This program shall be submitted by the contractor within a fortnight of the acceptance of the tender for the approval of the Engineer-in-charge, which will then form part of the contract and the work is to be carried out in all respects as per time schedule. The contractor shall afford all facilities;

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

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

c) The contractor shall afford all facilities for using scaffolding etc. by the other contractors. No extra claims on

account of facilities provided for carrying out the work mentioned above will be entertained.

3C. SPECIFICATIONS AND DRAWING

a) The drawings furnished to the contractor shall be interpreted by the use of given dimensions and nomenclature only, and the drawings shall not be scaled. Drawings to a large scale shall have precedence over those to a smaller scale.

b) Prior to the execution of the work the contractor shall check all drawings, specifications and shall immediately report all errors, discrepancies and /or omissions discovered therein to the Engineer-in-charge and obtain appropriate orders in the same. Any adjustments made by the contractor without prior approval of Engineer-in-Charge shall be at his own risk. Each description of item in the schedule of quantities shall be read in conjunction with the relevant drawings and specifications and the contractor's rate shall be deemed to be such complete work unless otherwise specified by the contractor while tendering.

c) Cost of all shop drawings, fabrication drawing of formwork drawings and details to be furnished by the contractor shall be deemed to be included in his tendered rates for the formwork. Approval of shop drawings shall not be considered as authorizing additional work of increased costs to the Department.

d) Prior to submission for approval, the contractor shall be responsible for thoroughly checking all drawings to ensure that they comply with the intent and the requirements of the contract specifications and that they fit in with the overall building layout. Drawings found to be inaccurate or otherwise in error will be returned for correction by the contractor.

e) For all drawings to be submitted by the Contractor for the approval of the Engineer-in-charge, the contractor shall submit 4 (four) copies of each drawings for approval.

f) The approval of the drawings by the Engineer-in-charge shall not be considered as a complete dimensional check, but will indicate only that the general method of construction and detailing is satisfactory. The contractor shall be responsible for the dimensions and design of adequate connection, supports, details & satisfactory construction of the work.

3D. TRAFFIC INTERFERENCE & INCONVENIENCE TO THE PUBLIC

The contractor shall conduct his operations so as to interfere as little as possible with the traffic. When interference to traffic is inevitable, notice of such interference shall be given to the Engineer-in-charge well in advance (at least 2 days). The contractor shall take all precautionary and other measures, such as providing warning signals, temporary diversions etc. all as directed by the Engineer-in-charge. The contractor shall exercise full care to ensure that no damage is caused by him or his workmen, during the operations, to the existing water supply and power lines. The cost of any such damage and risks arising out of this shall be entirely borne by the contractor. The contractor shall not deposit materials on any site which will seriously inconvenience the public. The Engineer-in-charge may require the contractor to remove any materials which are considered to be of danger or inconvenient to the public or cause them to be removed at the contractor's cost.

4. SPECIFICATIONS TO BE FOLLOWED

The work shall be carried out strictly in accordance with the contract specification. In the absence of any specification for any work or material, relevant Indian Standard Specifications will be applicable and where no Indian Standard Specification exists, relevant International Standard Specifications will apply. Further, in absence of any mention of specification in these specifications provided for the contract regarding work, material or workmanship, the decision of adaptability of relevant IS, BSS, American Standard Specifications or International standard etc, will be entirely at the discretion of Engineer-in-charge and the same shall be binding on the Contractor.

5. CLARIFICATIONS

The tenderer shall note that if any clarifications regarding specifications, conditions of contract, schedule of quantities, scope of work etc. are required, the tenderer should get it clarified prior to submission of bid document. No claim on account of any ambiguity in any respect will be entertained after the submission of the tender.

6. QUANTITIES

The schedule of quantities indicated in Schedule – "A" is only indicative and may vary. Payment will be made for actual quantities executed. Contractor's quoted rate shall remain firm for all such variation limits as specified under clause 11&clause 12 of Section-III General Conditions of Contract of the tender.

7. CARE IN SUBMISSION OF TENDERS

Before submitting the tender, the tenderer shall be deemed to have satisfied himself by actual inspection of the site, locality of the works, the geological and weather conditions of the site, approaches, availability of materials, camping facilities for the labour force etc. and ensure that all conditions liable to be encountered during the execution of the work are taken into account and that, the rates he quotes in the tender form are adequate and all inclusive to comply with the provisions of the special and general conditions of the contract for the completion of the works to the satisfaction of the Engineer-in-charge.

The tenderers shall furnish following information along with their bids;

7.1 Tentative completion schedules each activity wise.

7.2 Details of proposed specialized agencies for various investigation works, duly indicating the specific tests each agency is likely to execute.

7.3 Safety measures proposed for work.

8. SITE INSPECTION

The tenderer shall satisfy himself as to the nature and location of the work, the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials, availability of labour, water, electric power, roads and uncertainties of weather, or similar physical conditions of the site, the conformation and conditions of the ground character, the quality and quantities of surface and subsurface materials to be encountered, including the sub-soil water level, the character of equipment/facilities needed,

preliminary to and during the progress of the work, and all other matters upon which information is reasonable obtainable and which can in any way affect the work or his cost thereof under contract. Any failure of the contractor to acquaint himself with all the available information concerning these conditions will not relieve him of the responsibility of estimating properly, the difficulty or cost of successfully performing the work. The tenderer should visit the site at his own cost and familiarize himself with the site conditions, before submitting the tender. Non-familiarity with the site conditions shall not be considered as a reason for extra claims or for not carrying out the work in strict conformity with the drawings and specifications.

9. SPECIFICATIONS AND DRAWINGS

9.1 The work shall conform to the contract specifications enclosed in tender documents.

9.2 The work shall also conform to the drawings, and to such other drawings relating thereto as may be furnished from time to time by the Engineer-In-Charge in explanation of details or modifications, including such modifications as the Engineer-In-Charge may consider necessary to meet the conditions encountered during the execution of the work.

9.3 It shall be understood that drawings furnished to the contractor shall be interpreted by the use of given dimension and nomenclature only and that the drawing shall not be scaled.

9.4 Generally the construction drawings will be issued three months prior to concreting of a particular pour for planning purpose. In case of delay in supply of drawings, the Contractor will be eligible for suitable extension of time only, if in the opinion of the Engineer-In-Charge (whose decision shall be final) such a delay has affected the progress of work. The grant of extension of time shall, however, be governed by the provisions of the General Conditions of Contract.

9.5 Prior to the execution of the work, the contractor shall check drawings and shall immediately report errors, discrepancies and/or omissions observed therein to the Engineer-In-Charge. All such errors, discrepancies and/or omissions will be addressed by the Engineer-In-Charge. Any adjustment done by the contractor without prior approval of the Engineer-In-Charge shall be at his own risk and the settlement of any complications arising from such adjustment shall be made by the contractor at his own expense.

9.6 In case of difference between drawings and specifications, Para 8.1 of Section III General Conditions of Contract (GCC), shall be followed.

9.7 Concrete from bidders batching plant shall be supplied for departmental use and also for other agencies whenever recommended by NRB.

10. CONSTRUCTION PROGRAMME

The time allowed for carrying out the work as entered in the tender shall be strictly observed by the contractor and shall be deemed to be the essence of the contract and shall be reckoned from the date indicated in the work order. On award of the work, the contractor shall submit a detailed construction time schedule, keeping the phasing of the work generally in line with the construction schedule proposed by NRB, for the approval of the Engineer-In-Charge which shall form the part of the contract. The contractor shall strictly adhere to such an approved program.

11. SECURITY RULES

It may be noted that the construction site is within the preview of the Security Section, BARC. The contractor shall follow at site all security rules as maybe framed by the Department from time to time regarding removal/movement of materials and equipment from site, issue of identity cards, control of entry of personnel and all similar matters. The contractor and his personnel shall abide by all security measures imposed by the Engineer-In-Charge or his duly authorized representative from time to time. Contractor shall also follow all rules and regulations applicable to the area being declared/pronounced from time to time by the authorities or authority of existing Nuclear Recycle Board in the vicinity or any other statutory orders. Nothing extra will be payable on account of stoppage/hindrance of the work. The contractor, his employees and agents shall not disclose any information or drawings furnished to him by NRB. Any drawings, reports and other information prepared by the contractor/by NRB or jointly by both for the execution of the contract shall not be disclosed without the prior written approval of the Engineer-In-Charge. No photographs of the works or plant within the site premises will be taken without the prior written approval of the Engineer-In-Charge.

The identity cards/passes will be issued to the Contractor's staff and labour by NRB. Applicable penalty amount will be charged for issuing duplicate card in case of loss or damage of the card The Contractor shall complete the formalities like police verification etc. for their staff and labour as a precondition to issue of identity card/pass.

11.1. SECURITY REGULATIONS

The contractor has to follow strictly the security regulations prevailing in NRB Tarapur area from time to time especially in regard to working hours, movement of materials and entry permits. The security regulations in vogue are broadly as under:

1. The contractor shall make applications to the Engineer-in-charge everyday for issue of entry permits / photo passes for casual labourers to be deployed on the works.

2. On recommendation by the Engineer-in-charge, the contractor shall collect the required number, of tokens from the security Department and distribute the same among the authorized labour force. He shall also be responsible for accounting and surrendering of tokens issued by the Security department at the end of day's work. The tokens can be used only for short duration in the morning hours. In the event of loss or misplacement of tokens/vigil passes fee of Rs. 200/-for first instance/ Rs. 500/-for second instance/ Rs. 1000/-for third instance per token or as in vogue at time to time on the basis of police complaint will be levied.

3. The contractor shall make an application for the photo passes to be issued by the Security Department for his regular supervisory staff.

4. No persons other than those holding tokens or photo passes shall be normally be permitted to enter work

site. In case, the contractor desires to bring any other personnel to the work site he shall obtain permission of Security Department well in advance through Engineer-in-charge.

5. All materials and articles brought by the contractor to the work site shall have to be declared at the security gate. Similarly no materials shall be taken out from the Department premises without proper gate pass, which will be issued by the Engineer-in-charge to the contractors on written request. It is to be noted that loading of contractors materials in vehicles and trucks shall be done in the presence of Department personnel. The contractor's representative will have to escort the materials till the security check is over.
6. For working on Saturdays, Sundays, Holidays and late hours even through permission will be accorded by the Engineer-in-charge, the contractor will have to make application to the Security Department also and keep them informed well in advance. Any breach of above security regulations and rules in force from time to time will be viewed seriously.

As a part of keeping Nation-wide vigil on Government Establishments, the Security set up in NRB also has been beefed up and accordingly the following restrictions are in force till further orders.

a) Any motor vehicle with or without any construction related materials will be given an entry permit to NRB premises after convincing the purpose of entry, if and only if it is accompanied by an authorized departmental employee throughout its movement within the premises.

b) The movement of contractor's Vehicle within NRB premises is restricted and normally one specified vehicle will be permitted for his personal movement at the discretion of the Engineer-in-charge during the contract period after thorough security verification. The contractor has to apply for such vehicle permit to the department through the Engineer-in-charge in the standard pro-forma, after receiving the Work Order.

c) Each Labourer has to give his/her bio-data in the standard pro-forma to the Department for obtaining the labour entry pass and normally such an entry pass will be issued only after a thorough verification of the bio-data.

d) The Department will make every possible arrangement to minimize the inconvenience to the contractor from security point of view. However, due to any unforeseen reasons, any delay, inconvenience or loss occurred to the contractor no claim for compensation whatsoever in nature shall be entertained by the Department. The above additional regulations are indicated only to make aware the contractor about the latest security set up in NRB premises.

11.2. INFORMATION REGARDING ACCIDENTS

The contractor is also to promptly report the case(s) of the accident(s) involving injuries to his worker(s) to the local Security Post / Security Officer.

11.3. The contractor, his employees and agents shall not disclose any information or drawings furnished to him by Government. All drawings, reports and other information prepared by the contractor/by the Government or jointly by both for the execution of the contract shall not be disclosed without the prior approval of the Engineer-in-charge. No photograph of the works or plant within the premises shall be taken without the prior approval of the Engineer-in-charge.

11.4. VERIFICATION OF CREDENTIALS OF CONTRACTOR'S PERSONNEL

(a) Contractors, their employees, workers and casual labourers:

It will be the responsibility of the contractor to produce police clearance certificate for himself and his employees / workers before seeking permission for entry into NRB area.

Police verification certificate submitted with respect to an individual will be treated valid for 3 years from the date of issue and on expiry of 3 years period; a fresh police clearance certificate will have to be produced.
Original police verification certificate should be attached to the initial application for temporary identity card and in case of further renewals within six months a Xerox copy of the same can be attached.

The contractor shall employ labourers only after due verification of their credentials and track of past record. They should maintain a register showing the particulars of labourers including their residential address and submit the same to the Project Engineer-in-charge periodically for verification. The contractor shall ensure that no labourer with criminal record in the past is employed on NRB works. If any labourer with undesirable antecedents is found to be employed, the contractor shall forthwith remove such labourers from the worksite on demand by the Engineer-in-charge. The contractor shall be held solely responsible in the event of any adverse report / enquiry from the law enforcing authorities.
It will be mandatory on the part of the Tenderer to obtain Police Verification Certificate for their Engineer-in-charge, Supervisors and authorized representative, who reauthorized to draw tokens/passes for day today works inside NRB Campus. Tenderers are requested to take advance action to obtain Police verification Certificate for their authorized representative who desire to obtain photo passes, so as to avoid delay in commencement of work & also for issue of photo passes.

(b) Representatives of firms:

Representatives of firms who are required to visit NRB for supplying materials will not be issued with identity cards. They will be given entry by issuing entry permission on day to day basis.

12. EMERGENCY PREPAREDNESS DRILL

NRB perform mock emergency exercises regularly in line with stipulations defined by regulatory bodies as a part of emergency preparedness. All the contractor's workmen may have to undergo awareness programs on emergency preparedness which shall be arranged by NRB. The contractor's workmen may require assembling in the identified areas and registering their presence for accounting purpose. The prices quoted by contractor shall include the cost of such interruptions.

13. TEMPORARY APPROACH ROADS

The contractor shall construct and maintain at his own cost, the required temporary access roads and approaches to the work site, offices, workshop, and dumping yard etc. and in his camp area, with the prior approval of the Engineer-In-Charge. The contractor may use the roads formed by the Corporation in the

vicinity of the works for transport of equipment and materials. All roads at the work site including any road formed by the contractor shall also be used by the project, other contractors and agencies at site and the contractor is not entitled for any payment as compensation on this account. Contractor shall clean the spillover concrete and the other materials over the roads used by him regularly and take necessary action to avoid dust hazard by regularly sprinkling water on the road at his own cost.

14. WATER

Water will be made available to the contractor at site at one place on the main line to be determined by the Engineer-in-charge. The contractor shall make his own arrangements for drawing water from the main. He shall bear the cost of making all connections, boosting water, laying all the pipe lines, installing a tested meter of approved make, maintaining all installations and dismantling the same on completion of work and making good any damage due to such piping of work and its removal. The meter shall be provided with masonry chamber, with a lid and locking arrangement. The contractor shall pay for all the water drawn by him at the rate specified in Schedule 'B'. In case it is observed that the water meter is out of order the consumption of water for the period during which the meter was out of order shall be worked out on the basis of 1 % of the cost of items of construction requiring water, during the said period. The contractor shall provide at his own cost adequate storage of water required for his work and drinking for the labour to tide over temporary stoppage in the supply of water. No claims for any help of work in this account will be entertained.

15. REPLACEMENT OF METRIC UNITS BY BRITISH EQUIVALENTS

Wherever dimensions for materials, fittings fixtures to be used in work are given in metric units, materials with nearest British dimensions may be used with specific prior approval of the Engineer-In-Charge. No extra claim or variation in the rates will be entertained on account of this change.

15A. VARIATION IN DIFFERENT GRADES /SECTIONS OF REINFORCEMENTAND STRUCTURAL STEEL

Use of different Grades /Sections of structural, grades/diameter of reinforcement steel will be solely guided as shown in drawing/ specifications. Payment will be made for bending and placing in position/fabrication, on the basis of weight in tones as per rates included in the schedule of Quantities and Rates, irrespective of type of steel used. No additional payment shall be made on account of variation in diameters, change in type and grades of steel. If the contractor proposes to use higher section or diameter of steel due to non-availability of the required section in his stores/market, Engineer-In-Charge may permit the same based on the technical acceptability. In case the required section/diameter is not available in the Contractor's store but available in market and the Contractor wishes to use the available higher sections/diameters in their stores, the payment shall be restricted to the weight involved as per the drawing. In case the required section/diameter is available neither in the Contractor's store nor in the market, the payment will be made based on the higher section/diameter permitted for use. However, the contractor shall take prior written approval of the Engineer-In-Charge before taking any action to supply or use the alternate section. The payment of the steel shall be made as per the theoretical weight as per Technical Specifications of relevant item given in Section – V. No claim due to difference in the weights due to rolling margin shall be entertained.

16. OPENINGS IN FORMS

Tenderer shall note that a number of holes and openings will have to be provided in the forms to enable various embedment's and reinforcing bars to be fixed by the Contractor in position in concrete and such holes and openings will have to be formed by him without any extra payment. In heavy concrete vault, number of embedments for thermocouples, piping, radiation monitors, instrumentation etc, will have to be embedded by the Contractor. The carbon/ stainless steel-liners on the inside face of vault; cell and pool wall will be installed and welded in position by the Contractor to the required specification. No reinforcement bar will be cut or hot bent without specific approval of Engineer In Charge-in-charge for placement of embedments and for any other work.

17. SURVEY OF EMBEDDED PARTS

The Contractor shall ensure that all embedded parts as finally embedded and concrete finishes are within specified tolerances as shown in the drawings/ specifications. In case of variations the Contractor shall submit a procedure for rectification and after getting approval of the Engineer-In-Charge to the procedure, rectifications shall be carried out by the Contractor at his own cost. After the completion of concrete placement operation the Contractor shall resurvey all the critical embedded parts with reference to the finished concrete surfaces/grid line sand shall produce reports of survey of each such embedded part and concrete surfaces, giving there in its final location and tolerance attained vis-a-vis theoretical required. Details of critical embedded parts / areas where critical tolerances and finishes are required for the concrete surface shall be indicated by the Engineer-In-Charge from time to time.

18. MAINTENANCE OF CLEAN SITE CONDITION

During the construction stage the Contractor shall keep the entire site in neat and tidy conditions by proper housekeeping & stacking of construction materials at the construction site and will remove all debris and waste material from the site regularly. The curing water shall be constantly removed from various floors by adopting temporary dewatering scheme in the buildings and maintain the site in hygienic condition. Accumulation and piling of construction materials /debris/ tool boxes will not be permitted except only at the locations approved for this purpose. Construction material required for use for next 3 days only shall be stacked in the building keeping a clear passage for movement of personnel. The service lines viz. water, air, power cable, welding lead etc. shall not run on the floor but shall be routed by providing hangers on the walls and ceiling. Special care shall be taken to prevent spread of concrete, curing water and construction material, etc to other areas where plant equipment is already placed. Contractor's site office for his Engineer-In-Charge and labour shall be established using the standard PORTA CABINS and no site office shall be allowed inside the building.

19. HOUSEKEEPING

Notwithstanding the fact that other contractors are working in the same area, it shall be the responsibility of the contractor to maintain general cleanliness in the area, till area is taken over by Engineer-In-Charge after reasonable completion of job. In order to maintain general cleanliness in the area, the contractor may take the help/assistance from the contractors working in the same area. It is expected that specific area (say floor n) shall be taken over by NRB for housekeeping purpose after concreting of slab n+2and after de-shuttering/removal of the items/debris. The specific attention of contractor is invited to the fact that non-compliance of this provision shall invite penalties. Necessary labour shall be deployed for housekeeping at no

extra cost. It is also essential that contractor keeps all his moving machinery, vehicles, transit mixers; dumpers etc. during entry & exit to/ from plant site and to achieve this contractor shall make suitable arrangement for washing at his own cost.

20. CONTRACTOR TO PROVIDE LABOUR AND ASSISTANCE

The contractor shall provide necessary labour and assistance to the Engineer-in-charge for checking layout, alignments, levels and other survey works connected with execution of work and also of taking measurement for finished works at no extra cost to NRB. The Contractor will provide services of tower cranes along with crane operator and signal man and any other similar facility owned by the contractor to NRB. This facility will be used during the period when the crane is not in use by the main plant Contractor. Charges for such facility provided by the Contractor shall be paid on hourly basis at the mutually agreeable rates.

21. MODE OF MEASUREMENT

Mode of measurement when not specified in the tender shall be in accordance with relevant Indian Standard (IS) Specifications and in case the same is not spelt out in Indian Standard (IS), The Engineer-In-Charge decision shall be final and binding on the contractor.

22. VALIDITY OF RATE

The rates quoted by contractor shall be valid for a period as mentioned in the NIT. If any tenderer withdraws his tender within the validity period or make any modifications in the terms and conditions of the tender which are not acceptable to the department, then the Government shall without prejudice to any right or remedy, be at liberty to forfeit 50 % (Fifty Percent) of the Earnest Money absolutely. The rate for all items of work shall unless specified otherwise, include cost of all labour, materials, tools & plant appliances, transport, equipment, taxes, duties, cess, contractor's supervision, overheads, profits and any other item which is necessary for the satisfactory completion of the job. Further, the rates quoted by the tenderer in the schedule shall also be inclusive of sales tax on all materials, sales tax on contract turnover, labourcess on building & construction works, octroi duty, excise duty and/or other duties levied by the Government or by other public bodies. Unless otherwise stated in the schedule of quantities, rates for all items shall be for the complete work including supply and installation of all materials. The contractor, when called for by NRB, shall furnish detailed analysis in support of the rates quoted by him against each item of the tender. NRB reserves the right to utilize the analysis thus supplied in setting any deviations or claims arising on this contract.

23. TAXES

23.1. ROYALTIES AND DUTIES

All quarry fees, royalties, GST and other duties/levies on materials brought by the contractor to the site, will be paid for by the contractor directly. Assistance of Engineer-In-Charge will be limited to the extent of issuing a certificate stating that the materials so brought to site have become the property of NRB. If the quarry falls in private land or Government land leased to private parties, the contractor shall obtain the permission of such private parties and shall pay the royalties and other charges to them. Any variation in the rates of taxes/duties mentioned above, from those prevailing at the time of tender opening shall be borne by contractor.

23.2 SERVICE TAX – Not applicable

The tendered rates shall be inclusive of all taxes excluding Service Tax. 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.

23.3 WORKS CONTRACT TAX – Not applicable

The tendered rates shall be inclusive of Works Contract Tax (WCT).Any variation in the rate WCT during the execution of the contract within the contractual completion schedule from the rate of WCT (as indicated by tenderer in tender) prevailing at the tender opening date will not be considered for reimbursement/ recovery.

The work done value shall include value of work as per Schedule of Quantities & Rates (SOQR), additional quantities, extra items, substituted items, price adjustment amount and net secured advance paid during the period under consideration.

Note - The tenderer shall submit their bid after taking into consideration all the taxes and duties and no concession on any account.

23.4 DEDUCTION OF INCOME TAX

As per Income-Tax Act1961, as amended by Ministry of Finance from time to time, Income Tax at the applicable rate, as notified, will be recovered on the gross value of work done from the R.A. Bills. A certificate for the amount so recovered will be issued by NRB to the contractor on demand.

24. LAND FOR LABOUR CAMP & ESTABLISHMENT

24.1 NRB shall give suitable and limited area of land for the establishment of office, workshop, batching plant within the DAE site. However contractor shall make his own arrangement for establishment of the labour camp at nearby distance from the site, including, the allied facilities like temporary housing for labour, Establishment, and labour force, street lighting, treatment, storage and distribution of water supply, sanitation, access roads, electrification and general cleanliness of his camps will be done by contractor at his own cost and all these arrangement will be subject to the approval of Engineer-in-charge prior to construction of camps.

24.2 NRB shall also give suitable and limited land within the fenced area for Contractor's timber and steel yards, aggregate yards, workshop, office, site office, godowns and for erection of equipments. All the arrangements will be subject to the approval of Engineer-In-Charge prior to setting up of such facility.

24.3 After completion of works contractor shall at his own cost promptly dismantle all the houses and all other structures and vacate the areas and restore the land to the original condition.

24.4 Contractor shall be solely responsible for security and safe storage of all his materials/ including the materials issued to him by NRB and all his establishments.
24.5 The Contractor shall provide adequate facilities for medical aid and treatment for his staff and workers engaged on the project, both at work site, as well as at the camp.

25. WATER SUPPLY

The contractor shall make his own arrangements for construction water supply and water to meet the domestic requirements for his employees/ workers at labour camp.

25.1 PLANT SITE

The contractor shall make his own arrangements for ensuring sufficient storage of water supplied by NRB. NRB shall meter the supply of water to the contractor. For this purpose, the contractor will be liable to install and maintain a tested and certified water meter duly approved by the Engineer-In-Charge. The meter shall be provided with masonry chamber, with a lid and locking arrangement. The contractor shall at his own cost arrange to receive and distribute the water and shall lay and maintain water supply lines to his construction site. He shall construct suitable storage tanks to meet at least 4 day's requirement at worksite. To ensure adequate water supply at all levels on the works for the purpose of construction, he shall install necessary pumps, for delivery of water at all levels with requisite pressure. Water supply scheme proposed by the contractor shall be subjected to the approval of the Engineer-In-Charge. The contractor shall provide necessary number and capacity of electrical/diesel operated high lift pumps to ensure supply of water at the highest point of the structure. To ensure uninterrupted water supply in the event of power failure, contractor shall install diesel pumps as a stand by measure. The contractor shall ensure availability of potable quality of water as specified in the specifications. Chemical analysis of the water should be carried out to verify the quality at contractors own cost. No boreholes for withdrawal of the water shall be allowed in the plant area. The contractor shall pay for all the water drawn by him at the rate specified in Schedule - A. In case it is observed that the water meter is out of order the consumption of water for the period during which the meter was out of order shall be worked out on the basis of 1 % of the cost of items of construction requiring water, during the said period.

The contractor shall provide at his own cost adequate storage of water required for his work and drinking for the labour to tide over temporary stoppage in the supply of water. No claims for any help of work in this account will be entertained.

25.2 LABOUR CAMP

The contractor shall make his own arrangements for withdrawal, storage and distribution of water supply for labour camp.

26. FIRE FIGHTING

The contractor shall make his own arrangements for fire fighting and fire prevention both at the construction site and at his camp. He shall have storage of adequate capacity dedicated to meet the fire fighting and fire prevention requirement, both at the construction site and labour camp at his own cost. The equipment and piping (buried underground) required for this purpose will be installed and maintained by the contractor during the entire construction period till the works are handed over to NRB. Fire hydrants shall be provided at every floor in every building under construction. In order to meet the requirements during the power failure, the contractor shall have adequate number(s) of stand-by diesel pumps to meet the requirement during the fire fighting, A residual head of 7 Kg/sq.cm minimum shall be maintained at all times above the highest elevation of the structure. Not with standing this, the contractor shall be entirely responsible for the consequences arising due to fire, if it occurs during the period of construction and no payment will be made, or claim will be entertained on any account by the NRB. Fire fighting lines shall not be used for any other purpose. The cost of supply, erection, commissioning, operation, maintenance of the system shall be deemed to be included in the quoted rates. The detailed scheme to be followed is included in the drawings attached with this tender. The contractor shall furnish along with the tender the details of the measures he proposes to adopt for Fire Fighting / Fire Prevention works. The contractor shall also incorporate any additions/alterations in his Fire Fighting / Fire Prevention system as may be demanded by the Engineer-In-Charge based on the exigencies of the work.

The quoted rates against the items in schedule of quantities shall be deemed to have taken into account these measures for Fire Fighting / Fire Prevention. In case of emergency, the contractor shall permit the Engineer-In-Charge to use the contractor's Fire Fighting equipment for protecting material, work and equipment of NRB or other agencies working at site at no extra cost.

27. SUPPLY OF ELECTRIC POWER

Construction power supply will be made available on chargeable basis from 33/6.6KV/440 V outdoor sub-stations of NRB at a nominal system voltage of 440 volts at three locations in main plant area and in one location at camp area.

The Contractor shall also make his own arrangement of Diesel Generators to meet the requirement of electrical power during interruption in normal power supply. The tenderer shall furnish along with the bid the estimated requirement of electric power at plant site for the execution of the work in terms of maximum kWh demand.

Non-availability of regular power supply shall not be a reason for extension of time and /or extra payment. The NRB shall meter the supply of power to the contractor at his / their panel. For this purpose, the contractor will be liable to install and maintain a tested and certified duly approved by the Engineer-in-charge, Vector type energy meter, integrator type power factor meter and integrator type maximum demand meter at his own cost. Current transformer of 15 VA and 0.5 class accuracy and suitable ratio shall also installed and maintained by contractor (make of instrument shall be as per MSEB (Maharashtra State Electricity Board) approved make).The contractor shall make his own arrangement for the distribution of power to all his works from the

point of supply mentioned in para above. It shall be the responsibility of the contractor to provide and maintain the complete installation on the load side of the supply with due consideration to the safety requirements of site. All cabling and installation shall be subject to the approval of the Engineer-in-charge / Safety Engineer-in-charge and shall comply in all respects with the appropriate statutory requirements given as follows:

a) Indian Electricity Act 1910 (as amended)
b) Electricity Supply Act 1948 (as amended)
c) Indian Electricity Rules. 1956 (as amended) and shall be subject to approval of the Engineer-In-Charge.
d) Latest MSEB regulations.

For this purpose, the contractor shall provide full specifications of the equipment and the layout drawing for approval. Approval of the Engineer-In-Charge does not absolve the contractor from complying with any or all other conditions laid down in this section. The Power supply will also be regulated as per terms and conditions of supply of the Maharashtra State Electricity Board.

The Contractor shall have to install a duly checked power factor meter in his/their panels and maintain average power factor of not less than 0.90. Additional charges shall be recovered from contractors monthly bills, levied as per MSEB tariff revised from time to time for power factor below 0.90.NRB will not be liable for any loss / damage to the contractor's equipments as are sult of variations in voltage or frequency or interruptions in power supply.NRB will also not be liable for any loss to the contractor arising from failure, interruption or stoppage of power supply or variation in voltage or frequency.

Recovery for the power supply for construction purposes at site shall
be made from the running account bills of the contractor on the basis of actual consumption of connected load. Recovery towards construction power supply shall be at the rate given in Schedule-"B" Electricity charges. Power supply shall be subject to rules and regulations as applicable time to time for which contractor will not have any claim whatsoever. After completion of the work and after obtaining approval of the Engineer-In-Charge, the contractor shall promptly dismantle the power supply network erected by him. In case of any dispute, the MSEB terms and conditions shall be final and binding on the contractor.
The tenderers may submit along with their tenders the total approximate requirement of electric power that may be required by them for the execution of the work.

28. CONTRACTOR'S SITE ORGANIZATION

28.1 It is essential that the site organization is necessarily headed by an officer occupying a senior position in the organization and shall be vested with powers to take prompt decision. It is also incumbent upon the Contractor that the progress of the contract is reviewed once a month with the project authorities. In addition to the above, periodical reviews at management level shall also be conducted as and when required.
28.2 It is to be noted that the time is essence of contract and in order to meet the schedules and to meet targets the Contractor has to plan for work round the clock shift right from the initial stages. Necessary supervisory staff and the labour force shall be deployed in each shift to ensure that the schedules are met with.

28.3 The Contractor shall furnish along with the tender a detailed site organization he proposes to deploy on the works. The organization shall include the number and category of personnel of different grades for supervisory works up to the grade of Foreman/Asst. Foreman. (The distribution of staff and personnel shall be building wise/schedule wise/activity wise).

28.4 The Contractor will also submit along with the tender his assessed phase wise, induction of skilled, semi-skilled, un-skilled work force of all categories for the satisfactory and timely completion of the contract. The skilled, semiskilled categories are khalasis operators for cranes, pumps, compressors, electricians and operators, attendants, licensed blasters, operators for shovels, dozers, transport vehicles etc.

29 LIABILITIES FOR LOSS, DAMAGE, ACCIDENT ETC.

During the execution of the contract, and until completion certificate is issued, the contractor will be fully liable to compensate all concerned, for any loss, damage or destruction of "works", structures, materials, plant &machinery, persons, property etc. Including third party risk arising due to causes attributable to the Contractor as may be decided by the Engineer-in-charge whose decision in this regard shall be final. No claim shall be made against NRB on this account. The contractor shall immediately on award of work, take out at his own cost a "Contractor's all risk insurance policy" for an amount equivalent to work order value plus the cost of free issue materials of the works with an insurer acceptable to NRB which shall include inter-alia the value of all material issued to him free of charge by the project under terms of contract wherein NRB shall be named as "co-assured". The taking out of such policy shall not in any way limit or diminish the responsibility of the Contractor for any loss or damage.
Bidders may also note that separate insurance policy has to be taken by the contractor, at his own cost, for entire period of contract for workmen compensation, his own materials, equipment and third party insurance which is not covered under said CAR policy.

30. PLANT AND MACHINERY

30.1 The tenderer should submit along with the tender, phase wise deployment chart of plant & machinery. He should also indicate all the technical specifications for special and conventional equipment viz. Type, capacity, and year of manufacture / purchase of the plant and equipment Technical specifications shall indicate the capacity of the tower cranes with its reach, clearance below the hook, capacities of other portable Tower / mobile cranes. Batching plants, crushing plants, ice plant, and refrigeration plant.
30.2 List of tentative requirement of equipment recommended by NRB for deployment is enclosed as guideline only. The tenderer should study the equipment list carefully with reference to schedule to achieve planned activities / overall schedules. The tenderer may suggest/recommend additions/substitutions/deletions with justification/ detailed calculations in support of his assessed equipment deployment.

30.3 The tower cranes, placer booms, concrete pumps and portable cranes shall meet the requirements of handling/placement of concrete, formwork, Reinforcement steel, prefabricated liner panels for pool wall & vault, structural steel, embedded parts, hatch blocks etc. required for the construction of the Reactor Buildings and other plant buildings covered under this tender at various elevations. The tenderer shall submit along with his bid the quantum and type of workshop machinery/equipments like welding sets, lathes, drilling

machines, grinders, inspection tools and equipments both for construction works and to meet his own operation & maintenance requirement.

30.4 Notwithstanding the approval of equipment listed by the tenderer in his deployment chart, to enable timely completion of work, the contractor should also bring and deploy additional plants and equipment, at no extra cost to NRB, as may be deemed necessary by Engineer-In-Charge. The tenderer shall have two independent set-ups for production of normal and heavy concrete and also for crushing heavy and normal aggregates.

31. MOBILIZATION

Contractor shall mobilize site infrastructure viz. plant machinery, batching plant, crushing plant, ice plant, fabrication yards for formwork, Reinforcement steel, structural steel, embedded parts, concrete testing laboratory and personnel required for the satisfactory completion of the work as mentioned in tender document.

32. CONCRETE MIX DESIGN AND TESTING

32.1 All physical and chemical tests relating to fresh & hardened concrete and concrete making materials will be carried out by the Contractor at no extra cost. The Test laboratory shall have facilities of conducting tests on cement, mineral admixtures, coarse & fine aggregates, fresh & hardened concrete, NDT equipments, self compacting concrete, RCPT, bricks/ concrete blocks, rock, soil. All materials and manpower required for the test, such as aggregates, sand, cement, concrete and bricks etc. will be supplied by the contractor at his own cost to the site concrete testing laboratory or any other place as directed by the Engineer-In-Charge. However, the Engineer-In-Charge reserves the right to get the raw materials such as aggregates etc. tested in reputed laboratories and the cost of such test shall be borne by the contractor. All the associated work regarding conducting of tests and maintenance of record etc. shall be carried out by the contractor at his own cost. Contractor shall extend the facilities of testing to other contractors working at project after clearance from NRB. The settlement of payment/ charges for such testing shall be done directly with the respective contractor.

32.2 Two potential sources of sand have been identified from Tandulwari, Sonave & Bahadoli. The tenderer shall satisfy himself about the adequacy and quality of sand sources. He shall also investigate for additional sources of sand for the works, over & above what is mentioned. Written approval from Engineer-In-Charge for the quality of sand to be used is necessary. The natural sand will have to be washed if necessary as directed by Engineer-In-Charge. In case of inadequacy of the natural sand, the use of manufactured sand can be made after specific approval of the Engineer-In-Charge. Tenderer may make provision in his plants for the manufacture of sand from rubble. The use of manufactured sand or natural sand or combination of manufactured and natural sand will be decided on the basis of suitability by the Engineer-In-Charge. The natural sand from the above sources may be permitted after washing and rewashing if required. The washed water of the natural sand shall be free from chlorides and sulphates, whose presence, if any, shall be checked with silver nitrate and barium chloride respectively. Only on the specific approval from the Engineer-In-Charge, sand shall be permitted for usage.

32.3 Sources of Rubble/coarse aggregate has been identified from the following four major different quarries within 50 Kms from NRB, Tarapur are.

a) PS Pawde & Sons

b) Adhikari Brothers

c) Dattakrupa Stone Crusher

d) Lucky Stone Crusher

Tenderer may also investigate additional quarries for which prior approval of Engineer-In-Charge to be taken.

32.4 Coarse and fine aggregates shall be screened and washed/rewashed if necessary.

32.5 The contractor shall note that use of self compacting concrete (SCC) using fly as his envisaged for certain buildings in the scope of work. Therefore, the contractor shall be well equipped to produce, transport, place and finish SCC.

32.6 Design of concrete mixes for the various classes of concrete as latest relevant IS codes will be made by the contractor in the concrete testing laboratory. The proportioning of aggregates, cement, water, admixture, ice etc. established by tests in the laboratory shall be adopted by the contractor. This does not, however, absolve the contractor of his responsibility to produce concrete of requisite quality, strength and other characteristics as specified. Variations of proportions of mixes may be made from time-to-time as site conditions and material properties change. However, under no circumstances will the mix design be altered by the contractor without the written permission of the Engineer-In-Charge.

32.7 The contractor shall as per specification and direction of the Engineer-In-Charge, arrange to transport concrete moulds required for testing purposes and other tools and plant for casting concrete specimens from laboratory or from any other site of works to Site of works and also render all help by way of deputing adequate labour, staff for sampling of concrete for slump, workability, temperature etc.; filling in moulds, storage, curing and delivering of moulds with concrete specimens, tools and plant to concrete laboratory or any other place if the site premises as directed by the Engineer-In-Charge at the contractor's cost.

33. USE OF AREA PENDING COMPLETION

The Engineer-In-Charge shall be at liberty at any time to put into beneficial use whole or any part of the work, he may desire to use, pending full completion and taking over of the same. The decision of the Engineer In Charge shall be final and binding on both the parties as to whether the pending items of work are minor or important and if the Engineer-in-charge certifies that the items to be competed are important, not

withstanding anything contained in this, the taking over certificate shall not be issued unless all works have been fully completed to the satisfaction of the Engineer-in-charge. Such possession or use shall not be deemed to be an acceptance of any part of the contract.

34. RIGHTS OF OTHER AGENCIES

The contractor shall note that several other agencies may also be simultaneously working within and around the structures covered under the present contract. The contractor shall permit as directed by the Engineer-in-charge from time to time; such works to be carried out without any hindrance and fully co-ordinate his activities and extend all his co-operation to the other agencies working therein. In case of dispute in such co-ordination, the Engineer-in-charge's decision shall be final and binding on the contractor.

35. SAFETY MEASURES

To avoid possible accidents to staff and labour employed during execution of work, it is imperative to observe the safety code provisions specified under General Conditions of Contract, Safety Manual & AERB safety guide for construction and these shall be strictly followed. The contractor shall follow the safety regulations as prescribed in the tender and Indian Standards. He shall provide necessary safety appliances to his employees as instructed by the Engineer-in-charge /Safety Officer deputed by the Project depending upon the nature of work. Chains/ ropes or other lifting materials used for the suspension must be of adequate strength and suitable quality and shall be of tested quality. AERB Notification from time to time shall be strictly adhered to regarding the minimum safety measures to be adopted at the site. The requirement of industrial safety personnel at construction sites as per present notifications of AERB is as follows and the Contractor shall abide by the same.

Safety Officers: Qualifications: Degree in Engineering along with Diploma in Industrial Safety with min. 7 yrs experience.

Number-1 in each shift (minimum) If number of workers in a shift (including Contractors' workers) exceeds 1000, additionally 1 Safety Officer shall be appointed for every1000 workers. Safety Supervisors: Qualifications: Diploma in Engineering/ B. Scand Diploma in Industrial Safety with min. 3years experience.

Number-2 in each shift (minimum) If number of persons working in a shift (including Contractors' workers) exceeds 1000, additionally 1 Safety Supervisor shall be appointed for every500 workers. These safety personnel shall not be assigned any other responsibility.

The prime responsibility of the Contractor is to provide and maintain safe working conditions in their shops and at their work sites at all the times during the execution of the Contract. Following points shall also be adhered to during execution of contract:

a) The contractor shall prepare Construction Safety Manual covering all aspects related to safety specific to this contract in line with his Corporate Safety Manual, if available. Among other things, the manual shall also comprise of Safety Organization defining Roles and Responsibilities, Safety Training, Housekeeping,

Their Safety Organization having requisite Personnel with due qualification and being technically connected with the departmental safety organization at site, shall be responsible to take instructions from the Project Safety Organization and Project Line Managers concerning all safety related matters for due implementation. Contractors executing small value contracts shall deploy safety Supervisors/Coordinators working on the advice of departmental safety group.

b) It shall be bounden responsibility of the Contractor to deploy Task Performers, Supervisors and Workers on jobs, who are very well familiar with the safety requirements and safe working practices. For this purpose the Contractor shall implement an effective "**Induction Training Program**" for all the Task Performers prior to and during execution of the Contract. The induction training and retraining modules shall make the Task Performers fully aware of safe practices in working, and ensure their compliance with the safety practices, procedures and methods all the time.

c) Contractors shall ensure that all construction activities are performed following duly approved Procedures, methods and work instructions. All hazardous activities shall be duly identified, Procedures duly formulated for the same, approved and implemented, and continuously monitored for their effective implementation. Job Hazard Analysis (JHA) shall be undertaken, updated (if required) and documentation to this effect maintained.

d) The first aid centre, constantly manned by Medical attendant/attendants as per Schedule -F shall be established at site. Following is the list of equipment which shall be available in the first aid centre:

1. Bed - 1 No.
2. Treatment Cabin - 1 No
3. Treatment Chair - 1 No.
4. Water Tap and sink - 1 No.
5. Leg rest - 1 No.
6. Oxygen apparatus - 1 No.
7. Resuscitation apparatus - 1 No.
8. Stretcher - 1 No.
9. Cotton applicators - 2000 Nos.
10. Bandages of various types
11. Elastic rubber bands
12. Tourniquets
13. Antiseptics
14. Analgesics

e) The Contractors Safety Organization shall provide monthly safety statistics reports indicating man-hours worked, incidents and accidents if any, findings of safety inspections, training and SRDs etc. to Project

Authorities.

f) All safety precautions as advised by the Engineer-In-Charge/Safety Officer are to be taken while at work. All the deployed persons of the contractor shall have relevant qualification and required experience of the concerned job.

g) Contractor's persons shall undergo medical check-up by any MBBS Doctor before taking up the work above 2.5 M. from ground level/floor level and submit the certificate in the prescribed form at the time of enrollment of workers in NRB. Such person shall be subjected to medical checkup once in 12 months with respect to (a) Vertigo (b) Epilepsy/fits and (c) other height related medical problems and shall be arranged by contractor at his own cost.

h) The contractor shall at all-time keep his work spots, site office and surroundings clean and tidy, free from dust, rubbish, scrap, surplus material and unwanted tools and equipments, all scaffolding and temporary structure shall be removed as soon as the job for which these are intended, are complete. The welding and other electrical cable shall be routed to allow safe traffic by all concerned. All equipment and materials to be taken inside the plant building shall be cleaned thoroughly before taking them inside as well as outside.

a) All waste generated in the process of execution of the work is to be deposited compiling with the procedure as per ISO: 14001, Environment Management System. Defaulter shall be penalized.
b) Optimum utilization of resources like water, energy, fuel & manpower etc.
c) All efforts should be made to minimize the waste generation in the process of the execution of the job.
d) Any waste generated during the course of execution of the job, efforts should be made to re-use it elsewhere in consultation with Engineer-in-charge of the work. If the waste generated during the execution of the job cannot be re-utilized, it should be disposed in as per standard guidelines in Consultation with Engineer-in-charge of the work.
e) You shall ensure that all applicable legal and other requirements related to Environmental protection and pollution prevention are complied with.
f) You shall encourage the environmental benign methods while executing the job.
g) You shall ensure that all your workmen have attended the EMS Awareness Training Program on regular basis.
i) The contractor shall issue safety shoes and uniform to each worker. It is mandatory to wear safety shoes and uniform by contract workers at the project site. The cost of such safety measures shall be included by the tenderer in his rates quoted for various items in the schedule of quantities and rates.

Refer Construction Safety Manual as attached in www.barc.gov.in.

36. GOVERNMENT LABOUR ACTS / LAWS

The contract shall strictly follow the Government Labour Acts which are in force at present and introduced from time to time, such as Acts enforced by Regional Provident Fund commissioner, Directorate of ESIS and Enforcement Officer of Contract Labour Act and all necessary arrangements for Labour Security Insurance will have to be made by the Contractor at his own cost.

37. FAIR WAGES

The wage paid to the labourers shall not be less than the fair / minimum wages as fixed under any law, statutory rule or order from time to time. However, increase in the wages due to any statutory act or by rules framed there under by the Government or by local authorities during the currency of the contract or during any valid period of extension of contract shall not be considered reason for any reimbursement or extra claim. The bidder is deemed to have taken this aspect into consideration in his unit rates for various items of work covered under this contract. The notified rates of minimum wages as applicable to different categories of employees are given as under for the guidance of the tenderer.

CATEGORY RATES OF BASIC WAGES Applicable for TARAPUR

1. Unskilled : RS. 542.31 Per day
2. Semiskilled : RS. 561.54 Per day
3. Skilled : RS. 603.00 Per day

The rates are applicable for the period from 01/10/2020 onwards. The tenderer is advised to confirm the latest rate of minimum wages and special allowance, if any as declared by the State / Central Government on the date of submission of the tender. NRB/NRB, Tarapur is registered with Assistant Labour Commissioner (Central), under the Contract Labour (Regulation and Abolition) Act.

Note: The Contractor shall submit the labour report every month. The contractor shall strictly comply with all provisions of labour laws and subsequent statutory requirements in this regard. The contractor should take into account the provisions of the labour laws while quoting his rates.

38. LICENSE TO EMPLOY LABOUR

Contractor shall arrange labour license for the labourers employed by him directly or through one or more sub-contractors or agents or any other person, before he undertakes execution of the job. The Contractor shall get a license from the competent authority of the area where the work is undertaken under sub section 12(i) of the

contract labour (Regulation& Abolition) Act, 1970, in case twenty or more workmen are employed by him directly or through one or more sub-contractors or agents or any other person, before he undertakes execution of the job.

39. PRESENTATION BY SUCCESSFUL BIDDER

The successful bidder is required to make a detailed presentation before commencement of job. The presentation shall include all the points relevant to execution of this contract. These are:

a) Construction Methodology
b) Plant and machinery
c) QA System
d) Safety System
e) Plant and camp infrastructure
f) Site organization
g) Resource management
h) Training

40. REMOVAL OF TEMPORARY WORK, PLANT & SURPLUS MATERIAL

The contractor shall at his own expense remove from the site and dispose off the temporary structure, including all false work and scaffolding, grid work, all plant and material and debris for which he is responsible, to the satisfaction of the Engineer-in-charge. The acceptance of work shall be subject to compliance of this condition by contractor.

41. TRANSPORT OF MATERIALS

All materials supplied by NRB either frees of cost or on recovery basis shall be issued from the stores located at Plant site. All rates shall include the rate for transport of these materials including loading, unloading stacking, safe custody accounting etc. Contractor shall provide sufficient storage area/godowns for storing reinforcement steel, structural steel, embedded parts, and cement for other items. Contractors are advised to note that some items such as polysulphide compound, epoxy paints are required to be stored in air-conditioned rooms.

42. MATERIAL TO BE SUPPLIED BY NRB

During the execution of the contract, if any of the items listed in the schedule of supply of materials, either on chargeable basis or free of charge is not available in the Engineer-in-charge's stores and in the opinion of the Engineer-in-charge it may result in delay incompletion of work, the Engineer-in-charge may allow the contractor to purchase/supply materials as per the specifications of NRB to the extent to keep the progress of work or as may be deemed fit, by the Engineer-in-charge. The contractor shall be paid the actual amount for such purchase(s) including transportation costs on production of supporting vouchers/cash vouchers, bills etc. In addition to this actual cost, the contractor shall be eligible for 10% of the actual cost of purchase, towards storage, handling, overheads and profits.

43. MATERIAL SUPPLIED BY THE CONTRACTOR

All materials required for the work shall be supplied by the contractor from approved source. The bidder may please note that major items e.g. cement, reinforcement steel, paints, water stops, polysulphide caulking compound, high tensile steel etc. shall be procured directly from the manufacturers. Contractor shall supply free samples of material to be used on his works whenever asked for. Failure of any sample to pass the specified requirements for a particular use will be sufficient cause for rejection. The materials so rejected shall be removed from the site by the contractor immediately, failing which the same shall be removed by the Engineer-in-charge at the risk and cost of the Contractor. Major materials supplied for earlier projects from reputed manufacturers are mentioned below as a guideline. The quantities indicated are approximate and may change depending upon the actual work. Pre-qualification is not required for the procurement of materials if procured from the approved vendor's.

44. USE OF ROCK BOULDERS FROM STOCK PILES AT PLANT SITE

The Contractor will be allowed to select, load and transport at his own cost suitable excavated rock boulders, subject to availability, from the stockpile at plant site for use in concrete, RR masonry or soling only. A limited quantity may only be available. Recovery for the use of departmental excavated rock boulders will be adjusted from the Contractor's running bills on the basis of quantity of concrete, RR masonry and soling at the rate of Rs 400/-per cum of finished item. Recovery for concrete, masonry or soling will be based on volume paid as per measurement books. This item will be treated as fixed cost supplies/services for escalation.

45. CONSTRUCTION COMPLETION CERTIFICATE

As detailed in the scope and schedule of construction, this contract covers construction of complete civil and structural work and allied works in Main Plant. The Contractor shall complete the buildings in stages and hand over the floors after finishing in sequence of construction and order of priority given by Engineer-in-charge to take up the equipment installation and process system erection.

The site records shall contain following information.

1. Construction Methodology
2. List of Drawings
3. Procedures/QA Plan/Check List
4. Test Certificates for all materials used in the construction of the structure
5. In-situ/Lab test records on soil, rock
6. Geological mapping reports
7. Consolidation grouting report
8. Report of confirmatory geotechnical investigation
9. Qualification records for welding, splicing of rebars & reinforcement coupling

10. Test reports on continued performance/personal qualification on welding, splicing and reinforcement coupling

11. Qualification reports on all construction materials like water bars, paints, epoxy etc.
12. Test reports on structural steel, piping materials, sealing materials, paints etc.
13. Test reports on EPs and Tunnels (hydro/leak test)/EP fabrication reports
14. Pour cards
15. Batching plant records

i) Concrete requisition

ii) Starting slip

iii) Batch weight records, batching plant calibration records

iv) Slump and temperature casting of the samples (tests on fresh concrete)

16. In-situ test, if any, along with casting of specimens (during concreting)

17. Test records at laboratory periodical statistical analysis and charts

18. Post-concreting survey including floor levels
19. DCR and conformance reports
20. Reports on mock up, if any
21. Erection (certificates) reports – EPS and structural's
22. Test report on paint thickness etc.
23. QA (certificates) reports

24. As-built information including deviations

25. Correspondence with different agencies

26. Work completion reports/status reports

27. Audit and feedback reports

28. Procedure for calibration of lab equipment

29. Calibration reports of lab equipments

30. Personnel training and qualification reports

31. Any other reports/procedures desired by ENC to be incorporated in the file. The completed file shall be subjected to verification be Engineer-in-charge and periodic audit (6 months) by a committee constituted by NRB. After all the above information are compiled, verified by the Engineer-in-charge and certified for submission, the 'Construction Completion Certificate (CCC)' and 'System Transfer from Construction to Commissioning' in the prescribed format along with the System /Equipment History Docket shall be transferred for NRB records and reference. The cost towards preparation of CCC is deemed to be included in the quoted rates.

46. TRAINING

Plans shall be developed and implemented for timely selection and training of personnel to perform activities affecting quality, which shall form part of Contractor QA manual. All Personnel performing activities and processes shall have requisite basic education and qualification, relevant experience and proficiency required for carrying out a specific assigned task, and then the Personnel duly authorized. Where required by codes, standards, specifications or other specific requirements, Personnel performing activities affecting quality shall obtain necessary qualification/ certification and or re-certification/ re-qualification. These include welders and NDT Personnel. In many special areas/tasks as considered necessary by NRB procedures are established for the qualification of personnel on the basis of workmanship and/or any other criteria set. Personnel deployed for performing work and those for inspecting or verifying works shall be suitably trained and qualified to develop and maintain necessary proficiency in the areas of work assigned to them. All personnel involved in inspection and for non-destructive testing activities shall have knowledge of the requirements of the items, equipment, systems and of the applicable specifications and specific procedures. All such personnel shall be suitably qualified as per guidelines of BIS 13805 / SNT-TCIA (issued by ASNT) / similar guidelines applicable for different levels of proficiencies. For activities where formal qualification requirements do not exist, suitable procedures shall be established for the qualification of personnel on the basis of workmanship and experience. Some of such identified activities are: Routine Testing of Concrete ingredients, Fresh and Hardened Concrete, Concrete Consolidation and Finishing, Steel structure fixing by bolting, Heat jointing of PVC Water stops / Pipes, Sand/shot blasting, Air/airless spray Painting etc. For the above purpose, the contractor shall establish a training center at site for the same. The trained manpower shall be given colour coding.

47. ONE COPY OF THE DRAWINGS TO BE KEPT AT SITE

One copy each of the drawings furnished to the contractor shall be kept by the contractor at the site and the same shall at all reasonable times be made available for inspection and used by the Engineer-in-charge and any other persons authorized by the Engineer-in-charge.

48. WORK TO THE SATISFACTION OF THE ENGINEER-IN-CHARGE

Save in so far as it is legally or physically impossible the contractor shall examine and complete and maintain the works in strict accordance with the entire satisfaction of the Engineer-in-charge and shall comply with and adhere strictly to the instructions and directions of Engineer-in-charge on any important matter concerning the work. The contractor shall take instructions and directions only from the Engineer-in-charge or his authorized representative.

49. WATCHING AND LIGHTING

The contractor shall in connection with the works provide and maintain at his own cost all lights, guards, fencing and watching when and where necessary or as required by the Engineer In Charge-in-charge and duly constituted authority for the protection of the workers or for safety and convenience of the public or otherwise.

50. CONFIDENTIALITY CLAUSES

I. Confidentiality: No party shall disclose any information to any Third party' concerning the matters under this contract generally. In particular, any information identified as" Proprietary" in nature by the disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party. This clause shall apply to the sub-contractors, consultants, advisors or the employees engaged by a party with equal force.
II. "Restricted information" categories under Section 18 of the Atomic Energy Act, 1962 and" Official Secrets" Under Section 5 of the Official Secrets Act, 1923:Any contravention of the above-mentioned provisions by any contractor, subcontractor, consultant, adviser or the employees of a contractor, will invite penal consequences under the above said legislation.
III. Prohibition against use of NRB's name without permission for publicity purposes The contractor or Sub-contractor, consultant, adviser or the employees engaged by the contractor shall not use NRB's name for any publicity purpose through any public media like press, Radio, TV or internet without the prior written approval of NRB.

51. PROVISIONS UNDER CONTRACT LABOUR (REGULATION & ABOLITION) ACT 1970 REQUIRED TO BE FULFILLED BY CONTRACTORS.

1) Every Contractor employing 20 or more workmen on any day should obtain license from Asstt. Labour Commissioner, Sion, Mumbai. They should also obtain Registration under BOCW Act if they are engaged in construction activities. (Rule12).

2) Every Civil Contractor employing 10 or more workmen should obtain a Registration under Building and Other Construction Workers Act from Asstt. Labour Commissioner, Sion, Mumbai.

3) Notice of commencement of contract work should be given to Labour Enforcement Officer by the Contractor in from VI-A. {Rule~1(3)}.

4) Notice of completion of contract work should be given to Labour Enforcement Officer by the Contractor in Form VI-A. {Rule81 (3)}.

5) Notices showing rates of wages, hours of work, wage periods, date of payment of wages, date of payment of unpaid wages, names and addresses of Inspections in English, Hindi and in local language should be displayed at Work Site. {Rule 81 (i)}.

6) A copy of the above Notice is to be sent to Labour Enforcement Officer.
7) Maintain a Register of workmen in Form XIII. (Rule74).

8) Issue Employment Card to workmen in Form XIV. (Rule76).

9) Issue a Service Certificate to workmen in Form XV on termination of employment for any reason whatsoever. (Rule77).

10) Maintain Muster Roll of Workmen in Form XVI. {Rule78 (1) (a) (i)}.

11) Maintain Register of wages in Form XVII. Contractors may maintain a Combined Register of Wage-cum-Muster Roll, if the wage period is a fortnight or less.

12) Provide Wage slip to workmen in Form XIX. {Rule 78 (1) (b)}.

13) Maintain a Register of Deduction for Damage/ Loss in Form XX. {Rule 78 (1) (a) (ii)}.

14) Maintain a Register of Fines in Form XXI. {Rule 78 (1) (a) (ii)}.

15) Maintain a Register of Advances in Form XXII. {Rule 78 (1) (a) (ii)}.

16) Maintain a Register of Overtime in Form XXII. {Rule 78 (1) (a) (iii)}.

17) Send Half Yearly Return in Form XXIV to ALCILEO. {Rule 82 (1)}.

18) A first Aid Box with essential medical items to be maintained. (Rule 58).

19) Every contractor should ensure disbursement of wages to his workmen in the presence of authorized representative of NRB. (Rule 72).

20) Every contractor shall display an abstract of the Act and Rules in English, Hindi and in the language spoken by the majority of the workers. (Rule 79).

52. The **Escalation Clause 10 CA** will be applicable once the material is being utilized for the actual work. However indices of material covered under clause 10 CA will be applicable at the time of material brought to site.

53. ADDITIONAL CONDITIONS

1. MATERIALS OBTAINED FROM DISMANTLEMENT: The contractor in the course of their work should understand that all materials (e.g. stone and other materials) obtained in the work of dismantling excavation etc. will be considered Government property and issued to the contractor (if they require the same for their own use) at rates approved by the Chief Engineer. If they do not require these materials, they will be disposed off to the best advantage of Government.

2. DELAY IN OBTAINING MATERIALS BY THE DEPARTMENT: Owing to difficulty in obtaining certain materials in the open market, the Government has undertaken to supply materials as specified in Schedule' A' here to annexed rates states therein. There may be delay in obtaining the materials by the Department and the contractor is, therefore, required to keep himself in touch with day-to-day position, regarding the supply of materials from the Engineer-in-charge and to so adjust the progress of the work that their labour may not remain idle nor may there by any other claim due to or arising from delay in obtaining the material. It should be clearly understood that no claim whatsoever shall be entertained by the Government on account of delay in supplying materials. In case the materials included in schedule of supply of materials are not supplied by the Department and in case the use of such material is required in the works, the contractor with prior orders of the Engineer, for the use of such materials/ sections etc. from his own stocks or sources, may use of such materials of approved and tested quality. In all such cases the contractor shall produce the details of these materials such as quality, quantities including testing certificates and shall be entitled to claim extra payment for such use. The extra payment/ deduction would be the difference between the actual price (to be supported by vouchers) and the issue price.

3. Any damage to work resulting from rains or from any other cause until the work is taken over by the Department after completion will be made good by the contractor at his own cost.

4. The contractor shall get himself acquainted with the nature and extent of the work and satisfy himself about the availability of quarry and of kiln for collection and conveyance of materials required for the construction. The contractor's quoted rate should take into account all these factors, and will not be allowed any extra lead for collection and conveyance of materials for any reasons whatsoever.

5. The contractor shall deposit royalty and obtain necessary permit for supply of Red Bajri, stone kankar etc. from local authorities

6. Security deposit should not be paid till clearance certificate from Labour Officer is obtained by Contractor.

7. No area shall be allotted by the Department for setting up of labour camp.

8. Labour Camp shall not be erected at the site of the work nor shall any Labour be allowed to live at site.

9. The contractor shall conform to the provision of any Government acts which relate to works and to the regulations and by laws of any local authorities. The contractor shall give all notices required by the said acts or laws etc. and pay all fees payable to such authorities and allow for those contingencies in his tendered rates including fees for encroachments, costs of restorations etc. and all other fees payable to the local authorities.

10. The contractor shall undertake to have site clean free from rubbish to the satisfaction of the Engineer-In-charge. All surplus materials, rubbish etc. will be removed to the place fixed by the Engineer-In-charge and nothing extra will be paid.

11. CONVENIENCE FOR DEPARTMENT'S ACTIVITIES: The contractor shall not deposit materials on any site which will seriously be inconvenient to any of the Department's activities. The Engineer-In-charge may require the contractor to remove any materials which are considered by him to be of danger or inconvenience to the activities of the department or cause them to be removed at the contractor's cost.

12. EMPLOYMENT OF CERTIFIED PLUMBERS: Certified plumbers should be employed by the contractor on the work for main sewer filtered and unfiltered main.

13. EMPLOYMENT OF LICENSED ELECTRICAL FOREMAN (for electrical works only) the contractor should employ a licensed electrical foreman to supervise the electrical works.

14. The contractor shall not employ a woman and man below the age of 18 on the work of painting with products containing lead in any form, where ever men above the age of 18 are employed on the work of lead painting, the following principles must be observed for use.

i)a) White lead, sulphate of lead, products containing these pigments shall not be used in painting operation except in the form of paste or paint ready for use.
b) Measures shall be taken in order to prevent danger arising from the application of paint in the form of spray.
c) Measures shall be taken wherever practicable to prevent danger arising from dust caused by the rubbing down and scrapping.

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

b) Suitable arrangements shall be made to prevent clothing put off during working hours being spoiled by painting materials.

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

iii) a) Case of lead poisoning and of suspected lead poisoning shall be notified, and shall be subsequently verified by a medical man appointed by the Competent authority of NRB.

b) The NRB may require, when necessary a medical examination of workers.

c) Instructions with regard to the special hygiene precautions to be taken in the painting trade shall be distributed to working painters.

15. In any section of these specifications where item of material or equipment are specified by brand name, catalogue number or by names of manufacturers, the contractor is required to use the same material / equipment only. Equivalent to the material / equipment shall be acceptable (after reducing/increasing the rate to extent of difference in cost) in case of its non-availability and after confirming the same in writing from the manufacturer only with the written approval of Engineer-in-charge.

54. APPROVED TEST HOUSES BY NRB

1) NCCBM, BALLBHAGARH
2) CSMRS, NEW DELHI
3) CWPRS, PUNE
4) ACC, THANE
5) SERC, GHAZIABAD, CHENNAI
6) GML, BANGALORE
7) CBRC, ROORKEE
8) ESSEN & COMPANY, BANGALORE
9) SHRIRAM INSTITUTE FOR INDUSTRIAL RESEARCH, BANGALORE
10) GEOCHEM LABORATORY, MUMBAI
11) METALLURGICAL SERVICE LABORATORIES, MUMBAI
12) TORSTEEL RESEARCH FOUNDATION, BANGALORE
13) VJIT, MUMBAI
14) HIND HEAT TREATMENT, KOTA
15) INDIAN RUBBER MANUFACTURERS & RESEARCH ASSOCIATIONS,THANE
16) HBTI, KANPUR
17) NRB, MUMBAI
18) STRUCTWELL, MUMBAI.

IV (2) QUALITY MANAGEMENT REQUIREMENTS

1. SCOPE

This chapter specifies requirements to be incorporated in a Contractor's quality assurance program for construction. The contractor is responsible for planning and developing a program that assures that all his management; design and technical responsibilities for quality are incorporated and executed effectively. The program is aimed primarily at ensuring an efficient quality management in construction and taking corrective actions, when necessary.

2. QUALITY ASSURANCE

2.1 Assuring reliability and quality of work carried out under this package is the primary responsibility of the contractor. Contractor shall have a documentation quality system addressing the mechanism to achieve the required quality level and the work carried out conforming to the best manufacturing and work practices prevailing at the time of execution of contract.

2.2 Contractor shall have a well-structured organization of Personnel and resources to specify, achieve, verify and document all work. This should also include the approval from NRB wherever required. Quality system can be in line with National / International standards / models and shall address following areas.

- **a.** Design / Engineering whenever applicable.
- **b.** Procurement of consumable materials and Equipment's.
- **c.** Construction
- **d.** Subcontracting
- **e.** Special processes
- **f.** Measuring and Testing equipment
- **g.** Inspection and Test including non-destructive testing and other Examination of the material and equipment.
- **h.** Handling, Storing, Preservation, Packaging and Shipping.
- **i.** Item identification and Traceability
- **j.** Documentation and Quality records
- **k.** Disposition of non-conformances and Corrective action and Demonstrate
- **l.** Conformance of the work carried out meeting specified requirements

3. APPLICABILITY The requirements of this chapter apply to the construction activities when specified in a contract.

4. CONTRACTOR'S RESPONSIBILITIES

4.1 The Contractor / Vendor / Sub-vendors shall have an independent Quality Control Inspection and testing organization. They should also make provision for setting up a test facility wherever required. Personnel working in this group shall not have any other responsibility such as planning, safety and production. This department shall work in close co-ordination with the Quality Assurance Department of NRB and abide by their instructions in all aspects of work. The Quality Personnel performing all the package works are to be suitably academically qualified to have suitable professional experience in their relevant field. For example: NDE, Welding Technology, Metrology as applicable.

4.2 The Contractor shall furnish along with this bid an organization chart which includes the structure and size of the Manpower of the Quality Department for detailed scrutiny / approval and acceptance of NRB. Contractor's quality personnel shall be evaluated by NRB. Contractor Personnel found not suitable for performing the works shall be replaced immediately with efficient quality performers to ensure speedy execution of works without sacrificing quality.

4.3 Wherever found essential the contractor may have to provide for hiring outside inspection agency.

4.4 Following are the procedures to be developed to fulfill the above requirements.

- **a.** To develop and implement the controls and quality assurance procedures, that will promptly detect and dispose of, or prevent, non-conformances to contractual requirements.
- **b.** To comply with the NRB's requirements as specified in the contract.
- **c.** To prepare a quality assurance manual which shall be submitted for the Engineer-In-Charge's concurrence before the contract is awarded or at the latest before the work starts.
- **d.** To prepare a quality plan which shall be submitted to the Engineer-In-Charge before the work starts.
- **e.** To update and resubmit the quality assurance manual and quality plan to reflect current practices when significant changes occur in the contractor's program or organization in order to improve its effectiveness or to prevent recurrence of non-conformances.
- **f.** To initiate corrective measures promptly when any quality problems are identified or deviations from established requirements are noticed.

5. DEFINITIONS AND BASIC REQUIREMENTS

5.1 QUALITY ASSURANCE PROGRAMME - The contractor shall plan, establish, implement and maintain a quality assurance program that complies with the requirements of this chapter.

5.2 ORGANISATION - The contractor shall:

5.2.1 Clearly define management policies, objectives and responsibilities for quality assurance, including the responsibility of each division within a multidivisional organization. The responsibility and authority for quality of those managing and performing the work and of these auditing and verifying conformance to quality requirements shall be defined and their relationships shown on organization charts.

5.2.2 Provide for the review by management of the status and adequacy of the quality assurance program.

5.2.3 Define the responsibility and authority of personnel who are primarily responsible for quality assurance and their organizational independence during audits and define the responsibility and authority of personnel who are primarily responsible for quality control and their organizational independence to:

a. Identify and record quality problems
b. Initiate or recommend or provide solutions through designated channels.
c. Verify the implementation of dispositions.
d. Control further processing, delivery or installation of a non-conforming, item or service until the deficiency or unsatisfactory condition has been resolved. Note that, generally, audit personnel shall not be within the pattern of daily activities.

5.2.4 When inspection/quality control is to be performed by Personnel other than authorized inspectors then such a provision should be made in the concerned quality plans and should also be got approved from NRB

5.3 QUALITY ASSURANCE DOCUMENTS
5.3.1 QUALITY ASSURANCE MANUAL - The Contractor shall:
A. Prepare a quality assurance manual, approved and signed by a senior management official, and submit it for the Engineer-in-charge's concurrence before the contract is awarded or at the latest before the work starts. A quality assurance manual submitted under a previous contract or tender may be referred to.

B. Review and update the manual to reflect current quality assurance policies and procedures and resubmit the resulting manual

C. Implement the program according to the provisions specified in the manual. The Quality Assurance Manual shall deal as appropriate with the following:
a. Organization – The manual shall define the organizational measures.

b. Quality plan – The manual shall identify the group responsible for the quality plant and define its main principles and features in adequate procedures.

c. Quality assurance procedures documented quality assurance procedures shall be included or shall be outlined and cross-referenced. Referenced QA procedures shall be made available to the quality assurance representative.
d. Manual review – A statement shall be incorporated for reviewing and updating the manual.

5.3.2 QUALITY PLAN - The Contractor shall
A. Plan the inspection and test activities.
B. Identify in the quality plan the inspections and tests to be performed on the items listed in the contract, in compliance with contractual and / or technical requirements.

C. Submit the plan for the Engineer-In-Charge's concurrence / approval following the award of the contract and before the work starts. Referenced inspection and test specifications and / or procedures shall be made available to the quality assurance representative during the implementation of the quality plan. This quality plan shall identify at appropriate stage witness points and hold points and also give clearly the acceptance standards for all inspections, tests and examinations performed.

D. Update the plan during the life of the contract to reflect current conditions of manufacturing, construction, inspecting and testing and resubmit the plan to the Engineer-in-charge. The Quality Plan shall be on a format to be approved by the Engineer-in-charge. The quality plan shall deal as appropriate with:
a. Identification of the characteristics or items to be inspected and tested.
b. Identification of required inspection, test and special process operations and their relative location in the construction cycle. The contractor may include additional in-process inspection points for his own evaluation of quality which will not be subject to acceptance and witness by the quality assurance representative.
c. Reference to inspection, test and special process procedures, standards, acceptance criteria and sampling plan, if any. Indications of hold points beyond which the activity shall not process until the required inspections or tests have shown satisfactory results and have been documented.
d. Provisions for the Engineer-In-Charge to insert witness points at which activities are to be observed. The activity may nevertheless proceed beyond a witness point should the Engineer-In-Charge fail to attend in spite of due notification. The quality plans for subcontracted items, when concurred with by the contractor, shall be submitted to the Engineer-In-Charge as applicable, for concurrence and insertion of witness and hold points.

5.3.3 QUALITY ASSURANCE PROCEDURES - The contractor shall have procedures for the following specific requirements should they apply to the contract:

a. Document control
b. Procurement
c. Measuring and testing equipment
d. Inspection and test
e. In-process inspection
f. Final inspection
g. Inspection status
h. Identification and traceability
i. Preservation, handling and storage during construction
j. Construction
k. Special Processes
l. Quality records
m. Non-conformances
n. NRB-supplied items
o. Corrective actions

Each QA procedure shall define, as applicable, such things as; its purpose and scope; who is responsible for what; how all steps are to be performed; what materials, equipment and documentation are to be used; how it is all controlled. **QA PROCEDURE SHALL BE UPDATED WHEN NECESSARY.**

6. SPECIAL REQUIREMENTS - The Contractor shall establish measures to ensure that all essential quality related documents including but not limited to those listed below are reviewed for adequacy and approved for release by authorized personnel:

a. Quality assurance manual
b. Quality plan
c. Quality assurance procedure
d. Design documents
e. Procurement documents
f. Calibration procedures
g. Inspection and test procedures
h. Manufacturing documents
i. Special process procedures

6.1 Establish distribution lists for the above-mentioned documents, update and maintain them in the current form to assure that the proper personnel are issued with all the documents necessary to perform the work.

6.2 Make the applicable issues of these documents available at areas where these activities are performed.

6.3 Establish and update lists of applicable documents for construction and distribute them systematically. Controlled distribution is required for these lists only.

6.4 Ensure that changes to documents receive the authorizations by the same organizations as the initial documents unless other organizations are specifically designated. Maintain a record of changes as they are made written notes or documents are acceptable provided that they are made by authorized persons according to established procedures. Documents shall be revised and re-issued after a practical number of changes have been issued.

6.5 Control shall be established for disposition and removal of obsolete drawings, Procedures and other documents so that they may not be inadvertently used for works.

7. PROCUREMENT

7.1 SELECTION OF SUBCONTRACTORS/ VENDORS - The contractor shall identify items to be procured. He shall undertake the following:

A. Determine for these subcontracted items the applicable quality management requirements. Classification of these quality management requirements shall be in such a way that the overall quality is not impaired. The classification list shall be submitted to the Engineer-In-Charge for acceptance.

B. Evaluate and select subcontractors in accordance with of the applicable quality management requirements with regard to their ability to meet subcontract and quality requirements and the process of selection should be uniformed to NRB. NRB reserves the right to reject such subcontractors who are not found suitable to carry out intended works.

C. When off the self - items are to be procured; evaluation of subcontractor may not necessarily be required. The contractor shall nominate to the quality assurance representative those materials, parts and components that belong to this category.

7.2 SUBCONTRACT REQUIREMENTS - The contractor shall include in subcontracts the following, as applicable:

A. A clear description of the items or services to be procured including technical data and inspection and test requirements by reference to standards, technical specifications, drawings, etc.

B. A Designation of the applicable Quality Management Requirements to be applied to the items and exceptions, if any.

C. A Designation of the Contractor's QA procedures to be implemented by the subcontractor, if applicable.

D. Instructions for the Submission, retention and disposition of quality records.

E. Requirements for packaging and shipping, where applicable.

F. A Statement related to the right of access to the subcontractors premises and records for audit and / or surveillance by the contractor or the Engineer-In-Charge.

G. Instructions for notification of witness points and hold points.

H. Requirement for the subcontractor to report non-conformances.

I. Applicable Requirements to be extended to lower tier subcontractor, if any. Subcontract document shall be reviewed and approved in accordance with

J. All un-priced subcontracts and associated reference data shall be made available on request for review by the quality assurance representative.

7.3 AMENDMENTS TO SUBCONTRACTS - The contractor shall process amendments to subcontracts in the same way as initial subcontract and reference the initial subcontract number in the amendments.

A. Verification of the Quality Management System Implemented by the subcontract. Refer Applicable Quality Management Requirements.

B. Receiving Inspection to the extent that is practical, receiving inspection shall be specified in the quality plan. The Contractor shall,

a. Identify and inspect items on receipt to ascertain that they comply with contractual requirements. In determining the amount or nature of receiving inspection, consideration shall be given to the surveillance exercised at source and documented evidence of quality conformance. Receiving inspection shall cover as a minimum verification of deterioration or damage during transport, identification control, and review of required documentation.

b. Hold Incoming items until the required inspection and / or test have been completed or the necessary inspection and / or test reports have been received and verified except when items are released under positive recall.
c. Initiate corrective action with subcontractors when non-conforming items are received, as required by the nature and frequency of non-conformance. All measuring and testing equipment and devices used to verify characteristics that can affect item quality shall be controlled and maintained. At prescribed intervals, or prior to use, they shall be calibrated and adjusted against certified equipment having a known valid relationship to nationally recognized standards. Where no national standards exist, the basis employed for calibration shall be documented. No special calibration and control measures are necessary on rulers, tape measures, levels and other such devices; if normal commercial practices provide for adequate accuracy and / or if large tolerances are allowed for the corresponding measurements.

8. The contractor shall

8.1 Include in calibration procedures, equipment type, frequency of checks, and description of check method, acceptance criteria and action to be taken when results are unsatisfactory. Exception will be allowed for measuring and testing equipment for which calibration is simple and does not require a specific detailed procedure. The contractor shall identify those types of measuring equipment for which he has not provided calibration procedures.

8.2 Identify measuring and testing equipment with a tag, sticker, or other suitable indicator to show the calibration status.

8.3 Maintain calibration records for measuring and testing equipment.

8.4 Assess and document the validity of previous inspection and test results when measuring and testing equipment are found to be out of calibration. For concreting and earthwork activities.

8.5 The Above mentioned requirements are mandatorily applicable only to the following equipment and instruments.

- **a.** Laboratory scale
- **b.** Compression test machine
- **c.** Tensile test machine
- **d.** Batching plant
- **e.** Grout batching machine
- **f.** Concrete batching plant
- **g.** Soil-cement batching plant
- **h.** Gauge for mechanical splicing for all other equipment and instruments, the requirements are non-mandatory but they may be used as a guide.

9. INSPECTIONS AND TEST - The Contractor shall provide for the performance of inspections and tests as specified in the quality plan. These inspections and tests shall be carried out in accordance with written procedures that define the acceptance / rejection criteria. The contractor shall amend the selected inspection methods in cases where their unsuitability is demonstrated. Inspections and tests shall be documented in inspection and test reports that identify as a minimum the item inspected or tested, applicable drawings, specifications or procedures, the date of inspection or test, the inspector, tester or data recorder, the type of observation, the results, the acceptability and the action taken in connection with any deficiencies identified.

10. IN-PROCESS INSPECTION - The contractor shall

- **A.** Identify, inspect and / or test items as required by the quality plan.
- **B.** Monitor process methods, where inspection is not feasible.
- **C.** Hold items until the required inspections and / or test have been completed or necessary reports have been received and verified except when items are released under positive recall.
- **D. FOR CONCRETING ACTIVITIES –**
- **a.** The Contractor shall establish adequate measures for pre-concreting, in process and post-concreting inspections to be performed as applicable.
- **b.** A part of these inspections and the documentation thereof may be delegated to the works personnel. In such cases, the independent inspections can be reduced to an extent to be defined in the quality plan or in the inspection procedures only the approval of Engineer-In-Charge.
- **c.** Such Measures do not preclude complete independent inspections to be performed on a programmed basis or as consequence of results obtained.

11. FINAL INSPECTION - The contractor shall

Identify, inspect and / or test the completed item as required by the quality plan. And Verify that the item has been inspected at all points shown in the quality plan and that the records are adequate and completed.

12. INSPECTION STATUS - The contractor shall

12.1 Provide means for assuring that required inspections and tests are performed and that the acceptability of items with regard to inspections and tests performed is known throughout manufacturing and construction.

12.2 Establish and maintain a system for identifying the inspection / acceptance status by means of tags, stamped impressions, or other physical means to be affixed to the item or its container or by means of inspection records.

12.3 Show the Identity of the contractor and his inspector on any inspection marking used.

12.4 Provide for measures for controlling status indicators including the authority for application and removal of tags, stamps or other marking.

12.5 Identify non-conforming items until their conformity is established.

13. IDENTIFICATION AND TRACEABILITY - The contractor shall establish and maintain an adequate system to

13.1 Identify Each Item (lot, component or part) to the applicable drawing, specification or other technical document, throughout the whole construction process.

13.2 Assign to each item a unique identification where specific traceability is required by the contract.

13.3 Record this identification on all process, inspection and test records, where traceability is specified.

13.4 List the items that do or do not require traceability concerning concrete activities.

14. PRESERVATION HANDLING AND STORAGE - The contractor shall

14.1 Establish, maintain and document a system for the preservation, storage and handling of all items from the time of receipt through the entire construction process and subsequent storage to prevent abuse, misuse, damage deterioration or loss.

14.2 Periodically inspect stored items for condition and shelf – life expiry.

14.3 Inspect and test special handling tools and equipment at specific times to verify that the tools and equipment are adequately maintained and will not damage the items and will ensure safe and adequate handling.

14.4 Use specific written procedure and trained personnel for lifting of critical or high value items.

15. CONSTRUCTION - The Contractor shall clearly define the responsibilities for the documented preparation of works. This written preparation shall consist of instructions or work assignments. It shall be established in accordance with the construction schedule sand be available to the works and inspection personnel prior to commencement of work. This work instruction will document the following.

- **a.** Work methods
- **b.** Sequence of operations
- **c.** Workmanship criteria
- **d.** Type of equipment needed
- **e.** Special working environment, if any. For concreting and other common civil work activities, these instructions may be included in drawings, specifications or other design documents.

The contractor shall ensure that prior to release for construction all jigs, fixtures, tooling masters, templates, and patterns used for verifying quality are controlled. The extent and frequency of tool control shall be defined.

16. SPECIAL PROCESSES - The Contractor shall

16.1 Identify those special processes subject to the requirements of this clause. Special processes shall include welding, heat-treating and non-destructive examination, as applicable.

16.2 Establish documented procedures to assure that these processes are accomplished under controlled conditions by qualified personnel using qualified documented procedures and suitable equipment in accordance with applicable codes, standards, specifications, criteria and contractual requirements.

16.3 Maintain documentation for currently qualified personnel and processes according to the requirement of pertinent codes and standards

16.4 Define the necessary qualifications of personnel and procedures for special processes not covered by existing codes or standards, or where item or service quality requirements exceed the requirements of established codes or standards.

16.5 Not Consider Concreting as a special process. However the contractor shall ensure that foremen and vibrator operators are properly selected from experienced or trained personnel prior to assignment of works and are given regular training by concrete placement experts as needed.

17. QUALITY RECORDS - The Contractor shall:

17.1 Maintain quality records as evidence that:

- **a.** The quality assurance program meets the requirements of this Quality Management Requirement (manual, procedures, quality plan).
- **b.** The items or services meet contractual or other applicable technical requirements) specifications, drawings, calculations, manufacturing, inspection and test procedures).
- **c.** Personnel and procedures for special processes are qualified.
- **d.** Measuring and testing equipment is calibrated.
- **e.** The procurements meet the requirements.
- **f.** Corrective actions are being taken and are effective as required.
- **g.** Audits are performed as required.

17.2 Maintain Final performance quality records which include as appropriate:

- **a.** As built records
- **b.** Material test reports or certificates.
- **c.** Non-destructive examination records or certificates.
- **d.** Inspection and test records
- **e.** Non-conformance reports
- **f.** Concrete batch plant printout.

17.3 Identify, index and file quality records for easy retrieval.

17.4 Retain quality records for the time specified in the contract. If not specified, final performance quality records shall be retained for 10 years.

17.5 Provide a suitable environment for storing of records to minimize deterioration or damage and to prevent loss (the use of a double filing system is an acceptable methods).

17.6 Construction completion certification is an important part of this contract package. In order to give full meaning to this requirement all quality records shall be generated, got authorized by all agencies at appropriate stages, documented and preserved. Periodic audits by competent authority shall be performed on these documents to establish the efficiency. These audits reports are to be submitted to the Engineer-In-Charge to provide an effective feedback so that corrective action can be initiated on time.

17.7 Construction completion document has to be prepared incorporating all the essential requirements and records, giving justification that all the requirements of drawings, specification are met and the design intent is met and this document shall be made available to the Engineer-in-charge at the time of completion.

18.0 NON-CONFORMANCE - The Contractor is responsible for the identification and disposition of all nonconforming items, including those of subcontractors. Final acceptance of the contractor's disposition of those items that violate contractual requirements is the prerogative of the Engineer-in-charge. The contractor shall Establish and maintain measures for controlling non-conforming items that,

- **a.** Define the responsibility and authority of those who dispose of nonconforming items. This clause include provision for a technical review that involves those who are responsible for design, manufacturing, construction and quality functions, if these functions are concerned.
- **b.** Detect and record non-conformances promptly unless these are corrected immediately in accordance with common construction practices.
- **c.** Identify and hold non-conforming items for evaluation, these need not be held if subsequent work is not affected.
- **d.** Develop a disposition that has the concurrence of all responsible parties.
- **e.** Implement accepted dispositions. This clause includes requirements for re-inspecting and re-testing repaired and reworked items.
- **f.** Verify the implementation of accepted dispositions.
- **g.** Provide holding areas or methods for segregating non-conforming items to prevent unauthorized use, shipment or mixing with conforming items. However, where physical segregation is not practical or the nonconformance is not clearly visible, tagging, marking or other positive means of identification is acceptable.
- **h.** Maintain records that identify non-conforming items, the nature and extent of non-conformance, its disposition and objective evidence that repaired and reworked items have been re-inspected or re-tested according to applicable procedures.

19.0 NRB SUPPLIED ITEMS - The NRB is responsible for specifying in the contract the Quality Management Requirements applicable for items supplied by himself to the contractor and for certifying that these items are consistent with the quality requirement of the final items. The Contractor Shall

- **a.** Verify NRB verification.
- **b.** Examine NRB supplied items on receipt for completeness and proper type and to detect transit damage. Further receiving inspection is not required unless the contractor needs actual characteristics for subsequent work or unless specified in the contract. Examination may be deferred until further processing is scheduled if items are in sealed containers or have special preservation or packaging.
- **c.** Control NRB supplied items from receipt onwards according to the requirements of this standard.
- **d.** Report promptly in writing to the quality assurance representative, any NRB supplied items found damaged, lost, non-conforming, or otherwise unsuitable or unnecessary for use either on receipt or while in the contractor's custody.

20. CORRECTIVE ACTION - The contractor shall: Investigate the causes of significant or recurring non-conformances and take appropriate action to prevent repetition. Document and have reported to appropriate levels of the contractor's management causes of significant conditions that adversely affect quality and the corrective action taken.

21. QA PROGRAMME, FACILITIES AND PHYSICAL RESOURCES. - Prior to the award of a contract, and to the performance of the activity, the Engineer-in-charge shall evaluate the contractor's quality assurance program, manufacturing facilities and resources to determine whether the requirements of this section can be met. In the event of the contractor not fulfilling all applicable requirements, NRB may award the contract provided that he takes the responsibility for those QA requirements that will not be met by the contractor. In such a case, the exceptions shall be clearly defined in the contract.

22. QUALITY PLAN - NRB shall evaluate the quality plan and all revisions thereto in order to determine its acceptability. NRB shall indicate his witness points and hold points on the accepted quality plan. In addition, NRB shall perform surveillance according to the accepted quality plan.

23. ACCESS - The contractor shall provide for reasonable access of the competent authorities and of NRB to his premises and records for audit and surveillance purposes. Contractor shall be permitted to use the existing roads in the establishment area for the purpose of transporting labourers and materials etc. The Engineer-in-charge, however, will not undertake to provide any approach roads to the site of work. It shall be entirely the responsibility of the contractor to provide and maintain such temporary approach roads at his own cost for the purpose of movement of men, materials and equipment. Layout of such approach road shall be submitted to Engineer-in-charge for his approval before undertaking the construction of the same. Such approach roads shall be made available to other agencies carrying out the work in the same area in consultation with Engineer-in-charge of the works without any extra cost.

24. AUDIT - There shall be provision for having periodic internal audits conducted on the Quality Assurance System and the activities affecting quality of this package. These audits may be carried out once in six months by independent group of the contractor.

24.1 The Contractor shall agree to have periodic Audits conducted by NRB Internal Audit Group. The contractor shall be bound to provide corrective actions and responses when some non-conformances are reported at these audits.

24.2 The Contractor shall refer to the scope of supply of various materials and other services by the Engineer-in-charge. The contractor is deemed to have taken due account of the same while arriving at the

rates for supply of various items as per 'Schedule of Quantities and Rates'. Items of work which have not been covered anywhere but are needed for the correct and satisfactory execution of the work shall be carried out by the contractor to the entire satisfaction of the Engineer-In-Charge.

24.3 The rates for the items included in the 'Schedule of Quantities and Rates' are inclusive of all material, labour, plant and equipment, transport and storage of materials and equipment, necessary supervision by Contractor's /manufacturers authorized representatives, overheads, profits and all incidental expenditures(s) as may be required for the complete and satisfactory execution of the work covered under this contract.

25. ADDITIONAL REQUIREMENTS/INFORMATION

25.1 Total responsibility with regard to quality surveillance/quality control, inspection shall be with the Contractors.

25.2 NRB will be represented by a Quality Surveyor designated by the Engineer-in-charge. The Quality Surveyor and his designated staff will be responsible for checking the quality of work to the extent necessary as per relevant procedures and inspection plans to assess compliance with the provisions of the specifications. His surveillance shall not be limited only to examination of the end product but he shall have complete access to the work and the right to intervene where bad practice is detected. He shall also have the right to conduct or require the contractor to perform, any additional inspection or testing he deems necessary. Any unacceptable defects noted by such tests shall be rectified by the contractor without any extra cost to NRB. The surveillance provided by the Engineer-in-charge or the approval by the Quality Surveyor of finished work shall not relieve the contractor of any of his responsibilities under this specification. The rejection of any work not meeting these specifications is possible at any time. The contractor shall maintain quality control records, which shall have details of all the quality control operations that were performed. The quality surveyor shall have the right to witness any such operation and call for such record.

25.3 Right in the tendering stage itself, the contractor shall give an organization chart including number of persons to be deployed on the work, qualification along with their experience, justifying the adequacy to meet the construction schedule.

25.4 Minimum number of personnel to be deployed by the contractor, requisite educational qualification and experience shall be subjected to the verification of NRB.

25.5 The package contractor shall also provide an organization chart for quality control inspection etc. with proper interfacing with the contractor's executive groups and purchaser's executing and quality assurance groups and NRB.

25.6 NRB's responsibility to quality will be only in the form of QA function.

25.7 All efforts shall be made by the contractor to keep the laboratory facility available throughout the contract period.. In the event of testing machine being out of order, contractor shall arrange the testing of materials at his cost at any laboratory approved by NRB.

25.8 List of pre-qualified/approved test houses, organizations will be given by NRB. If contractor proposes any other standard/certified laboratory, such laboratories will be evaluated for their adequacy in fulfilling the requirements. On fulfilling the requirements, NRB will approve such laboratories for further testing. Cost of evaluation shall be borne by the contractor.

25.9 For site inspection activities, a sample quality assurance plan will be provided to the contractor. He has to make his own detailed plans containing witness and hold points, and get it concurred/accepted by the concerned Purchase Engineer-in-charge.

25.10 Contractor shall submit the approved construction methodology (in parts) and required procedures well in advance of commencement of work. At first instance, it shall be treated as a part of mobilization. These documents shall be revised whenever need arises.

25.11 To achieve speedy implementation of commissioning in the schedule time, the contractor shall be responsible for completion relevant systems to the fullest extent before taking up pre-commissioning.

25.12 Contractor shall have a clear cut documentation policy which shall include generation of reports, completeness at appropriate time and careful storage of records.

25.13 Contractor shall propose procedures for pre-qualification, procurement/ storage/testing and handling of the materials required for the present package at the time of tendering.

25.14 The contractor shall have in-built facilities for internal audit of all the reports/documents at least once in six months to see that his quality Assurance system is working, the works are proceeding in proper direction and non-conformances are being identified and corrective actions are in vogue. In addition to the above, there shall be internal audit by site QA, Contractor shall be responsible for audit, feedback, initiating DCR's implementation status, traceability of records.

25.15 The contractor shall prepare and submit the construction completion certificate (CCC) as per the sample format approved by NRB. The Documents required to be enclosed in the CCC will have to be maintained by the contractor, in their record room in an easily accessible form right from the start of construction to completion.

IV (3) - LIST OF APPROVED VENDER

26 GENERAL NOTES

27 1. Products with relevant I.S. markings from the I.S. Licensed manufacturers, who are in the market for the last three years with valid I.S. License, shall be considered for approval. Only “First” quality materials shall be used.

28 2. Employer reserves the right to choose any of the approved make/vendors as per this list.

29 3. In case of products not indicated in this list, only BIS marked products shall be used subject to prior approval of Engineer-in-charge.

30 4. Specification of manufacturer’s item shall be checked against tender item / specifications before selecting any product or brand name. In case of any discrepancy, tender item / specifications shall prevail and any such brand of item shall not be used which is not conforming to tender specifications even if it is listed in this list.

31 5. For use of material from a BIS listed / certified manufacturer, the contractor shall furnish a copy of the valid BIS certificate to the Employer before procuring the material.

32 6. In case of non-availability of any item / material among approved manufacturers / brands, alternate manufacturers / brands conforming to BIS / BS etc. shall be proposed along with required credentials for Employer’s approval.

33 7. Employer reserves the right to accept/reject any new brand(s) proposed by the tenderer / contractor.

34 8. Samples of all materials, fittings etc. to be incorporated in the work shall be submitted by the contractor and got it approved from the Engineer-in-Charge, before supply in bulk at site of work. Wherever particular make or its equivalent is mentioned in the item schedule, the decision of the Engineer-in-Charge in selection of particular make or its equivalent shall be final and binding on the contractor. The approved samples will be kept in custody of the Engineer-in-Charge till completion of the work. Materials not conforming strictly to the approved samples will be rejected

CIVIL WORK

SR. NO.	DESCRIPTION OF MATERIAL	APPROVED MAKE/VENDER
1	ORDINARYPORTLANDCEMENT	ULTRATECH/ACC/GUJARAT AMBUJA /GRASIM/JK CEMENT
2	PORTLANDPAZZALONACEMENT	ULTRATECH/ACC/GUJARATAMBUJA
3	WHITECEMENT	BIRLAWHITE/ JKWHITE/ ULTRATECHWHITE/ ZUARIWHITE
4	CONCRETEADMIXTURES	BASF/ FOSROC/ ROFFE/ SIKA
5	HYSDBARS	SAIL/ TISCO/ RINL/ JINDAL
6	STRUCTURALSTEEL	SAIL/ TISCO/ RINL/ JINDAL
7	STAINLESSSTEEL	SALEMSTEEL/HINDALCO/ JINDAL
8	NONSHRINKGROUT	BASF/ FOSROC/ ROFFE/ SIKA
9	POLYSULPHIDESEALING COMPOUND	BASF/ FOSROC/ ROFFE/ SIKA
10	EXPANSIONJOINTS (THERMAL/ SEISMIC) WITHCOVERS&TRIMS	KANTAFLEXINDIAPVT.LTD./ FREYSSINET/ CSEXPANSIONJOINTS/ VEXCOLT/ ROBINSON
11	CURINGCOMPOUNDS	BASF/ FOSROC/ PIDILITE–DR.FIXIT
12	REPAIRMORTARSFORDAMAGES	BASF/ FOSROC/ PIDILITE–DR.FIXIT/SIKA
13	PLASTERADDITIVE	BASF/ FOSROC/LATICRETE

14	EXPANSIONJOINTS	BASF/ PIDILITE/ LATICRETEOTTOSEAL/ DOWCORNING
15	READIMIXPLASTER	ULTRATECHCEMENTLTD/ ROOFIT/ RAMCO
16	GLASS	SAINTGOBAIN/ GLAVERBEL/ PILKINGTON
17	GLASSPARTITIONSYSTEM	JEB/ RAUMPLUS/ DORMA/ INFRASYS
18	EPOXYCOATING	BASF/ FOSROCCHEMICAL(I) / SIKA PVT.LTD./ SIKA/ CLEANCOATS
19	FLOORHARDENER	BASF/ FOSROCCHEMICAL(I)PVT.LTD./ SIKA
20	ALUMINIUM /DOORS/WINDOWS SECTIONS	JINDAL ALUMINIUM LTD./ HINDALCO
21	DOORS/WINDOWS FITTINGS	EVERITE AGENCIES P LTD./ GOLDEN INDUSTRIES/ DOORKING INDUSTRIES/ GODREJ/ EBCO I/ D-LINE/ GARD/ UNION/ DORMA/ HAFELE/ MEPLA/ MAGNUM
22	DOOR LOCKS	GODREJ/ VIJAYAN/ NEKI/ ACME/ UNION/ DORSET/ HETTICH/ HAGER/ INGERSOL RAND/ YALE
23	WATERPROOFING COMPOUND	BASF/ FOSROC/ SIKA/ PIDILITE – DR. FIXIT
24	PAINT	BERGER PAINTS/ ASIAN PAINTS / SHALIMAR PAINTS/ ICI PAINTS / ICI INDIA LTD./ NIROLAC PAINTS
25	PRE-COATED PROFILED G.I. GALVALUME/ ZINCALUME SHEETS	LLOYD INSULATION (I) LTD.(LLOYDECK)/ INTERARCH BUILDING PRODUCTS (P) LTD.(TRACDEK)/ MULTI COLOUR STEEL (I) PVT.LTD. MULTI CLAD)/ HARDCASTLE & WAUD MFG. CO.LTD.(FERO COLOUR)/ JAPAN METAL BUILDING SYSTEMS PVT.LTD.(JMBS)/ TATA BLUESCOPE STEEL LTD.(TRIMDECK)/ ERA BUILDING SYSTEM LTD.(ERA)/ SHREE PRECOATED STEEL LTD.(METACOLO UR)
26	ALUMINIUM SHEET	HINDALCO/ INDAL/ JINDAL/ BHORUKHA
27	FIBRE GLASS SHEET & PANELS	SIMBA FRP P.LTD.
28	ANCHOR FASTENERS	HILTI INDIA PVT.LTD./ FISCHER FIXING SYSTEMS (MICO) LTD./ PHILIPS/ GKW
29	WATER STOPS	M/S. OMAI PLASTICS / BASECON PASK / ASIAN ENGINEERING PRODUCTS / CAPRIHANS INDIA LTD / R.C. ENTERPRISES / KANTA POLYMERS(KANTA FLEX) & FIXOPAN
30	SURFACE MAPPING	GEOLOGICAL SURVEY OF INDIA (GSI)

IV (4) - APPENDIX

APPENDIX – 'A'

FORM OF BANK GUARANTEE BOND FOR PERFORMANCE SECURITY /SECURITY DEPOSIT

1. In consideration of the President of India (hereinafter called "The Government")having agreed under the terms and conditions of Agreement No..... dated.....made between .....and ..... (Hereinafter called "the said Contractor") .for the work ..... (Hereinafter called "the said Agreement") having agreed to production of a irrevocable bank Guarantee for Rs. ..... (Rupees ..... only), as a security /guarantee from the contractor for compliance of his obligations in accordance with the terms and conditions in the said agreement, we .....(Indicate the name of the Bank) (hereinafter referred to as "the Bank") hereby undertake to pay to the Government an amount not exceeding Rs. ..... (Rs.....only) on demand by the Government.

2. We ..... (indicate the name of Bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Government stating that the amount claimed is required to meet the recoveries due or likely to be due from the said Contractor(s). Any such demand made on the bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs..... (Rupees.....only).

3. We, the said bank, further undertake to pay to the Government any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal relating thereto, our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s) shall have no claim against us for making such payment.

4. We..... (indicate the name of Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Government under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till Engineer-in-charge on behalf of the Government certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.

5. We ..... (indicate the name of Bank) further agree with the Government that the Government shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Government against the said Contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of the Government or any indulgence by the Government to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

7. We,..... (Indicate the name of Bank) lastly undertake not to revoke this guarantee except with the previous consent of the Government in writing.

8. This guarantee shall be valid up to ....., unless extended on demand by Government. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to Rs. (Rupees ..... only) and unless a claim in writing is lodged with us within six months of the date of expiry or the extended date of expiry of this guarantee, all our liabilities under this guarantee shall stand discharged.

Signed and sealed

Dated the ..... day of ..... for .....

(Indicate the name of Bank)

*****

APPENDIX - 'B'

PROFORMA FOR GUARANTEE TO BE EXECUTED BY THE CONTRACTORS FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF WATERPROOFING WORKS.

Name of work:

Work order No:

Agreement No:

This agreement made this _____day of_____ two thousand and _____between_____ (hereinafter called the Guarantor of the other part) and the PRESIDENT OF INDIA

(Hereinafter called the Government of the one part) WHEREAS THIS agreement is supplementary to a contract (hereinafter called the Contractor dated and made between the GUARANTOR OF THE ONE PART AND GOVERNMENT of the other part, whereby the Contractor, interalia, undertook to render the buildings and structures in the said contract recited completely water and leak proof. AND WHERE THE GUARANTOR agreed to give a guarantee to the effect that the saids structures will remain water and leak proof for_____years from the date of _____. NOW THE GUARANTOR hereby guarantees that waterproofing treatment given by him will render the structures completely leak proof and the minimum life of such waterproofing treatment shall be 10 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 / alteration of structures and for such purpose:

(a) Misuse shall mean operation which will damage treatment, like chopping of firewood and things of the same nature which might cause damage.

(b) Alteration shall mean construction of an additional structure or a part or construction adjoining to existing structure whereby treatment is removed in parts.

(c) The decision of the Project Director with regard to cause of leakage 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 waterproof 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 the 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 guarantor's cost & 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 execute the waterproofing or 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 Guarantor in performance and observance of this supplemented agreement. As to the amount of loss and/or damage and cost incurred by the Government the decision of Engineer-in-Charge will be final & binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the Obligator (Guarantor) _____and _____ for and on behalf of the President of India on the day, month and year first above written.

SIGNED SEALED AND DELIVERED BY (Obligator / Guarantor) in the presence of:

1.

2.

Signed for and on behalf of the President of India in the presence of

1.

2.

APPENDIX - 'C'

INDENTURE FOR SECURED ADVANCE

(For use in cases in which the contract is for finished work and the contractor has entered into an agreement for the execution of certain specified quantity of work in a given time.)

Government of India

BHABHA ATOMIC REASERCH CENTRE

State: Maharashtra

Administration: Department of Atomic Energy

Division: NUCLEAR RECYCLE BOARD

THIS INDENTURE made the.....day of .....19..... BETWEEN ..... (hereinafter called the Contractor which expression shall where the context so admits or implies be deemed to include his executors, administrators and assigns) of the one part and the President (hereinafter called the President which expression shall where the context so admits or implies be deemed to include his successors in office and assigns) of the other part.

WHEREAS by an agreement dated ..... (Hereinafter called the said agreement) the contractor has agreed.

AND WHEREAS the contractor has applied to the President that he may be allowed advance on the security of materials absolutely belonging to him and brought by him to the site of the works, he subject of the said agreement for use in the construction of such of the works as he has undertaken to execute at rates fixed for the finished work (inclusive of the cost of materials and labour and other charges).

AND WHEREAS the President has agreed to advance to the contractor the sum of Rs ....on the security of materials, the quantities and other particulars of which are detailed in Part-II of a Running Account Bill (B) for the said works signed by the contractor on ..... and the President has reserved to himself the option of making any further advances on the security of other materials brought by the contractor to the site of the said works.

NOW THIS INDENTURE WITNESSETH that in pursuance of the said agreement and in consideration of the sum of Rs. ..... on or before the execution of these presents paid to the contractor by the President (the receipt where of the contractor both hereby acknowledge and of such further advance, if any, as may be made to him as aforesaid the contractor both hereby convenent and agree with the President and declare as follows:

1. That the said sum of Rupees .....so advanced by the President to the contractor as aforesaid and all or any further sum or sums advanced as aforesaid shall be employed by the contractor in or towards expenditure the execution of the said works and for no other purpose whatsoever

2. That the materials detailed in the said Running Account Bill (B) which have been offered to and accepted by the President as security are absolutely the contractor's own property and free from encumbrances of any kind and the contractor will not make any application for or receives a further advance on the security of materials which are not absolutely his own property and free from encumbrance of any kind and the contractor indemnifies and president against all claims to any materials in respect of which an advance has been made to him as aforesaid.

3. That the materials detailed in the said Running Account Bill (B) and all other materials on the security of which any further advance or advances may hereafter to be made as aforesaid (hereinafter called the said materials) shall be used by the contractor solely in the execution of the said works in accordance with the directions of the Divisional Officer of the said works, Civil Engineering Division (hereinafter called "the Divisional Officer) and in the terms of the said agreement.

4. That the contractor shall make at his own cost all necessary and adequate arrangements for the proper watch, safe-custody and protections against all risks of the said materials and that until used in construction as aforesaid said materials shall remain at the site of the said works in the contractor's custody and on his own responsibility and shall at all times be open to inspection by the Divisional Officer or any officer authorised by him. In the event of the materials or any part thereof being stolen, destroyed or damaged or becoming deteriorated in a greater degree that is due to reasonable use and wear thereof the contractor will forthwith replace the same with other materials of like quality or repair and make good the same as required by the Divisional Officer.

5. That the said materials shall not on any account be removed from the site of the works except with the written permission of the Divisional Officer or an officer authorised by him on that behalf.
6. That the advance shall be repayable in full when or before contractor receives payment from the President of the price payable to him for the said works under the terms and provisions of the said agreement. Provided that if any intermediate payments are made to the contractor on account of work done there on the occasion of each such payment the President will be at liberty to make a recovery from the contractor's bill for such payment by deduction there from the value of the said materials than actually used in the construction and in respect of which recovery has not been made previously the value for this purpose being determined in respect of the each description of materials at the rates at which the amounts of the advances made under these presents were calculated.

7. That if the contractor shall at any time make any default in the performance or observance in any respect of any of the terms and provisions of the said agreement or of these presents the total amount of the advance or advances what may still be owing to the President shall immediately on the happening of such default be repayable by the contractor to the President together with interest thereon at twelve percent per annum from the date of respective dates of such advance or advances to the date of repayment and with all costs, charges, damages and expenses incurred by the President in or for the recovery thereof or the enforcement of this security or otherwise by reasons of the default of the contractor and contractor hereby covenants and agrees with the President to repay and pay the same respectively, to him accordingly.

8. That the contractor hereby charges all the said materials with the repayment to the President of India they said sum of Rs. and any further sum or sums advanced as aforesaid and all costs, charges, damages and expenses payable under these presents PROVIDED ALWAYS and it is hereby agreed and declared that not-withstanding anything in the said agreement and without prejudice to the powers contained therein if and whenever the convenant for Payment and repayment herein before contained shall become enforceable and the money owing shall not be paid in accordance there with the President may at any time thereafter adopt all or any of the following courses as he may deemed best.

a) Seize and utilise the said materials or any part thereof in the completion of the said works on behalf of the contractor in accordance with the provisions in that behalf contained in the said agreement debiting the contractor with the actual cost of effecting such completion and the amount due in respect of advances under these present and crediting the contractor with the value of work done as if he had carried it out in accordance with the 42 said agreement and at the rates thereby provided. If the balance is against the contractor he is to pay same to the President on demand.

b) Remove and sell by public auction the seized materials or any part thereof and out of the moneys arising from the sale retain all the sum, aforesaid repayable or payable to the President under these presents and pay over the surplus (if any) to the contractor.

c) Deduct all or any part of the money owing out of the security deposit or any sum due to the contractor under the said agreement.

9. That except in the event of such default on the part of the contractor as aforesaid interest on the said advances shall not be payable.

10. That in the event of any conflict between the provisions of these presents and the said agreement the provisions of these presents shall prevail and the event of any dispute or difference arising over the construction or effect of these presents the settlement of which has not been herein before expressly provided for the same shall be referred to the Director, GSO, NRB, BARC, Tarapur time being in force shall apply to any such reference.

IN WITNESS thereof the said ..... and..... by the order under the direction of the President have hereinto set their respective hands the day and year first above written. Signed, sealed and delivered by the said contractor in the presence of:

Signature

Name

Address

Witness

Signed by the order and direction of the President in the presence of:

Signature

Name

Witness Address

* * * * * * * * * * * * * * *

APPENDIX - 'D'

GUARANTEE BOND FOR ANTITERMITE TREATMENT

(For Guarantee to be executed by contractors for removal of defects after completion of antitermite treatment works)

This agreement made this.....day of ..... two thousand .....between M/s..... (Hereinafter called "the Guarantor of the one part) and the PRESIDENT OF INDIA (hereinafter called "the Government" 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 Government of the other part whereby the Contractor inter-alia undertook to render the buildings and structure completely termite proof.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the effect that the said structure will remain termite proof for ten years from the date of handing over of the building and or completion date of contract whichever is later.

NOW THE GUARANTOR hereby guarantees that the anti-termite treatment provided by him will render the structures completely termite proof and the minimum life of such antitermite treatment shall be ten years to be reckoned from the date of handing over of the building and/or completion of the building whichever is later. Provided that the Guarantor will not responsible for damages caused due to structural defects or misuse of premises/area.

a) Misuse of premises shall mean any operation which will disturb the chemical barrier like excavation under floors, breaking of walls at G.L. disturbing the treatment already carried out. The decision of the Engineer-in-Charge with regard to cause of damage shall be final. During this period of guarantee the guarantor shall make all the arrangements to do the post constructional anti-termite treatment in all the buildings in case of any termite nuisance being found in the building, to the satisfaction of the Engineer-in-Charge at the cost of guarantor and shall commence the work for such treatment within seven days from the date of calling upon him to rectify the defects, by the Engineer-in-Charge, failing which the work shall be got done by the Department 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 execute the anti-termite treatment or 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 the Department 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 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.....and by.....and for and on behalf of the PRESIDENT OF INDIA 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 PRESIDENT OF INDIA BY.

..... in the presence of:

1.

2.

APPENDIX - 'C'

(On Rs 100/ Stamp Paper)

CONFIDENTIALITY & NON-DISCLOSURE AGREEMENT

This Agreement is entered into on this day _____ (date month and year) _____ by & between President of India acting through GM, INRPO, BARC Tarapur, Department of Atomic Energy, Government of India, located at Tarapur-401 502 (herein called GM) and M/s _____ (full name and address of the company/ supplier) _____ (herein after called _____) maintaining confidentiality in respect of _____ (particular in brief of the deal with the company / supplier, giving in brief details of know-how, if any, developed by either parties or jointly) _____ . The agreement will coexist with the main agreement remain in force, which ever expires earlier. Now, therefore, for and in consideration of mutual covenants and promises contained herein the parties to the Agreement hereby agree as follows:

1. 'Confidential' information shall include all information which are by their nature confidential, disclosed in confidence by one party to the other party directly or indirectly, in written or any other tangible form, before or during the term of this agreement. By way of illustration, it would include supply of information relating to other party's research, development, engineering data, specifications, process, formulations, production operation and / or techniques, software and other information of similar nature, in connection with the business. For the purpose of this agreement 'Confidential information' shall not include:

a) Information which is in the public domain at the time of disclosure.

b) Information which although originally confidential information's, becomes available broadly to the public through no fault of the party hereto under separate agreement or applicable law.

c) Information independently developed by or known to the employees or agent of the party hereto, provided such party can show that the employees concerned have had no access to confidential information hereunder.

d) Information which comes to a party on a non-confidential basis from a source other than a party hereto, its employees or agents provided that such source is not bound by the confidentiality agreement with or other obligations of confidentiality or secrecy to the other party hereto under a separate agreement or applicable law.

2. Confidential information received by any party pursuant to this agreement shall not disclosed to any other third party person(s) (except to the employees or agents of the receiving party having a need to know), without the express written consent of the disclosing party. The receiving party shall ensure that each employee or agent having access to confidential information will be made aware of the agreement and will be made to comply therewith.

3. The receiving party shall use the confidential information permitted under other written agreements between the parties and shall not use or exploit such information for its own benefit or for the benefit of others without the prior written consent of the disclosing party.

4. The contractor shall protect any such confidential information disclosed pursuant to this agreement with at least the same degree of care that it regularly employs to safeguard its own priority and confidential information from unauthorized use or disclosure.

APPENDIX -F

Form of Earnest Money Deposit
Bank Guarantee Bond

WHEREAS, contractor..... (Name of contractor) (Hereinafter called "the contractor") has submitted his tender dated..... (Date) for the construction of..... (Name of work) (Hereinafter called “the Tender")

KNOW ALL PEOPLE by these presents that we..... (Name of bank) having our registered office at..... (Hereinafter called "the Bank") are bound unto..... (Name and division of Executive Engineer) (Hereinafter called "the Engineer-in-Charge") in the sum of Rs..... (Rs. in words .....) for which payment well and truly to be made to the said Engineer-in-Charge the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this..... Day of..... 20..... .
THE CONDITIONS of this obligation are:

(1) If after tender opening the Contractor withdraws, his tender during the period of validity of tender (including extended validity of tender) specified in the Form of Tender;

(2) If the contractor having been notified of the acceptance of his tender by the Engineer-in-Charge:

(a) Fails or refuses to execute the Form of Agreement in accordance with the Instructions to Contractor, if required;

OR

(b) Fails or refuses to furnish the Performance Guarantee, in accordance with the provisions of tender document and Instructions to contractor,

OR

(c) Fails or refuses to start the work, in accordance with the provisions of the contract and Instructions to contractor,

OR

(d) Fails or refuses to submit fresh Bank Guarantee of an equal amount of this Bank Guarantee, against Security Deposit after award of contract.

We undertake to pay to the Engineer-in-Charge either up to the above amount or part thereof upon receipt of his first written demand, without the Engineer-in-Charge having to substantiates his demand, provided that in his demand the Engineer-in-Charge will note that the amount claimed by his is due to him owing to the occurrence of one or any of the above conditions, specifying the occurred condition or conditions. (Modified vide OMDG/CON/266 dt. 02.05.2013)

This Guarantee will remain in force up to and including the date* ..... after the deadline for submission of tender as such deadline is stated in the Instructions to contractor or as it may be extended by the Engineer-in-Charge, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE .....

SIGNATURE OF THE BANK
SEAL

WITNESS .....

(SIGNATURE, NAME AND ADDRESS)

*Date to be worked out on the basis of validity period of 6 months from last date of receipt of tender.

GOVERNMENT OF INDIA

BHABHA ATOMIC RESEARCH CENTRE

Nuclear Recycle Board, Tarapur

(SECTION – V)

TECHNICAL SPECIFICATION

1. SCOPE OF WORK

This tender document is for the Supply, Installation, Testing, Commissioning and Training of CCTV & lighting System at BARC, Tarapur. The brief description of scope of work is as follows -

a) Supply, Installation, Testing, Commissioning and Training of CCTV & lighting System (as specified under item no. 1 to 95) at BARC, Tarapur

b) Implementation of Intrusion detection and alarm system, based on CCTV camera Video Analytics- The scope includes configuration of camera and related software to detect intrusion and generate the intrusion alarm. For assessment of alarm camera live view and prerecording should also be played simultaneously. Nearest dome camera should be configured to follow the intruder and live view of the dome camera and relevant fixed cameras shouldbe shown on main screen. Multiple intrusion detection shall be detected and programmed for assessment also. All the intrusion alarms shall be recorded with time stamp. For accurate time stamp, time stamp of local NTP server (installed at site) shall be used.

c) Integration of existing Electric security fencing with CCTV software and implementation of intrusion detection and alarm system based on electric fencing – The scope includes integration of existing electric security fencing with CCTV. Respective energizers of existing multi zone electric security fencing will generate digital output and same is to be connected to IO extender. IO extender will communicate with CCTV software and trigger the intrusion alarm. For assessment of alarm camera, live view and prerecording should also be played simultaneously. Nearest dome camera should be configured to follow the intruder and live view of Dome camera and relevant fixed cameras shouldbe shown on main screen. Multiple intrusion detection shall be detected and programmed for assessment also. All the intrusion alarms shall be recorded with time stamp. For accurate time stamp, time stamp of local NTP server (installed at site) shall be used.

d) Implementation of IP Based Intrusion alarm announcement system and interfacing with CCTV and electric fence based intrusion detection system- The scope of work includes IP based announcement system and SIP mike. The system shall be addressable type. Two numbers of SIP mike will be installed, one in control room and other in alternate control room, IP based speakers will be installed in the field. There should be provision to do announcement at defined speaker as well as all speakers. The system shall be integrated with Electric fencing and CCTV intrusion software so that if there is intrusion detection alarm in particular zone then automatic annunciation with prerecorded message shall be announced in that zone. All the intrusion alarms shall be recorded with time stamp. For accurate time stamp, time stamp of local NTP server (installed at site) shall be used.

e) Two years comprehensive warranty of all components as per item no. 96.

2. GENERAL CONDITIONS FOR CONTRACTOR

a) The contractor shall deploy a team of technically qualified and experienced manpower for the work at BARC site on all working days (Monday to Friday) from 09:00 to 17:30 hrs. The contractor shall ensure regular availability of the team at site and suitable alternative arrangement shall be made in the period of absence of any team members.

b) The contractor shall ensure that no labours with criminal records are employed on the BARC work.

c) Bidder shall strictly comply with the work permit system being followed in BARC TARAPUR for carrying out any work in Plant Premises.

d) Submission of police verification certificate for all the workers is mandatory. Without police verification certificate the contractor persons will not be allowed inside the BARC complex for the work. Contractor pass should be applied in standard format as attached as (Form-B).

e) The successful party/contractor shall ensure that all safety precautions are invariably taken to safeguard accidents and injuries to his own workmen. All necessary safety equipment as per the safety regulations and requirements for job shall be provided by the contractor at his own cost.

f) The contractor shall depute at least one engineer for handling all installation and commissioning activities at site. Due to security region and nature of work, it may be ensured that the identified site engineer and supervisor shall be available consistently till the completion period of the work.

g) The contractor shall intimate in writing to the Engineer about completion & handing over of the work. The Engineer shall then arrange for final inspection and the contractor shall rectify deficiency noticed if any. The contractor's work shall be considered complete only after successful execution of the entire work under scope in all respects, removal of scaffolding items, machinery, cleaning and handing over to the Engineer.

Following documents shall be submitted by the contractor to the Engineer:

a. Actual Measurements
b. Non-subletting certificate

3. BIDS & DATASHEETS

3.1. Quotations with technical details, data sheets, commercial conditions, certificates ofapprovals for the components, testing procedures, commissioning procedures of earlierinstallations shall be submitted.

3.2. In order to implement the above system, an item list is generated and attached as schedule A. Any other additional components/ Sub components/ Drivers/Software (not mentioned in Schedule-A), if required, for the functioning and implementing the scope of work shall be offered and the rate may be included in suitable items of Schedule-A. A list of all such miscellaneous items may be submitted along with the tender.

3.3. Item wise preferred make and model are mentioned in"schedule of acceptable make and model" for technical reference. Three or more make/models have been suggested, however equivalent make and models in compliance to all the tender technical specifications are also acceptable with prior approval from Engineer In-charge.

3.4. Apart from the above, it may be noted that the bidder shall also submit exact make and model of offered item along with technical bid in the attached format as "Schedule of quoted make and model". If bidder fails to submit "Schedule of quoted make and model", technical evaluation of the bid will not be carried out.

3.5. A point wise compliance with respect to all the technical specification indicating details of deviations, if any, shall be provided.

3.6. The supplier shall provide the relevant documents such as system write up, system block diagram, technical datasheets, brochures and installation, commissioning and maintenance guidelines of the offered system.

3.7. Copies of certification as specified in the technical specifications shall be submitted for technical evaluation of the offer.

4. PRE DISPATCH INSPECTION

Pre dispatch inspection for all the items shall be carried out at supplier's/OEM premises having all the facility to test the quoted item. Vendor shall intimate at least 15 days before during pre-dispatch inspection on function tests and demonstration of performance shall be carried out as per the tender specification. Pre-dispatch inspection involves different sets of tests as per tender specification.

a. Physical Test
b. Operating Voltage Range Test
c. Functional Test
d. System Specifications Test includes verification/confirmation of technical specification of each component of the system with full indent/tender specification by referring supplied OEM datasheet/leaflet/test report with the system.
e. Configuration Test
f. Communication Test
g. Verification of Certificates

5. TRAINING:

The bidder shall impart training during the last phase of commissioning of the CCTV system. The training shall comprise of two independent modules as "User Training" & "System Administration & Maintenance Training".

a) **<u>USER TRAINING</u>**:

i. The user training shall be a formal comprehensive training program for one working day duration.
ii. The scope of this training shall cover day-to-day operations to be carried out by the users for monitoring using CCTV system.
iii. The topics covered in this training are to be documented as "USER MANUAL" and one copy shall be provided to each of the participants.

b) <u>SYSTEM ADMINISTRATION & MAINTENANCE TRAINING:</u>

i. This shall be a formal training program for BARC TARAPUR personnel for a period of minimum three working days and shall be conducted in a single batch.
ii. The training shall cover the following but not limited to the aspects of the system offered:
   (a) Configuration and system administration of individual components, system as a whole including video recording and management software.
   (b) System use and operation
   (c) Hardware / Software familiarization
   (d) First line maintenance and trouble shooting
   (e) Back-up and archiving of recorded video data
iii. Topics covered in this training are to be documented as "System Administration and maintenance manual" and one copy each of this shall be provided to each of the participants.

Both the above mentioned training programs shall be arranged at site i.e. BARC TARAPUR Plant. The class room for training shall be provided by BARC TARAPUR. The bidder shall provide training manual as detailed above to each participant.

6. DOCUMENTATION AND DRAWINGS:

The contractor shall furnish minimum 01 (One) hard copies each & 01 (One) soft copy each on CD/ DVD media of the documents as specified below. Formal system acceptance shall be contingent upon receipt of all required and necessary BARC TARAPUR approved documentation.

a. **Technical Manuals**: These Manuals shall include all equipment OEM's technical brochures in their original format, System block diagrams, Hardware design, specifications, system functional descriptions, instruction manuals for installation and commissioning, outline dimensions, mounting details and power requirements. All these are to be provided in separate volumes.

b. **Operation & Maintenance Manuals**: These manuals shall be designed to serve both as tutorial and reference manuals. The manuals shall contain all necessary information to completely operate, maintain and trouble shoot the CCTV system. The manuals shall include, but not limited to vendor's instruction manuals for the maintenance & trouble shooting the system and overall system maintenance. These manual shall contain drawings pertaining to equipment layout, assembly/disassembly, cable routing and cable termination, details in junction boxes at various locations with terminal tag numbers etc. Instructions including preventive maintenance & troubleshooting procedures should be part of these manuals. All these are to be provided in separate volumes.

Software: All software in original including CCTV management software, merging software for CCTV and E fencing shall be licensed and shall be supplied in CD/DVD. All software drivers for equipment/ peripheral devices supplied shall be of latest versions.

7. Other Requirements

As all the items are to be installed and integrated as a single system, Bidders are requested to quote the rates for all items and purchase order will be issued on overall technically suitable lowest offer basis. Tenders without rate for any of the item shall be treated as incomplete tender and shall summarily be rejected.

i. Installation includes digging of tar road, soil, concrete road cutting, refilling after digging, throwing away debris, Cable termination, Casing Capping, HDPE pipe laying with accessories, GI Pipes laying with accessories, Splicing of Fibre Cable, etc. as per the site requirement and instruction of BARC, Tarapur.

ii. Cables need to be mounted on the wall, ceiling or pathway connecting the fullcomplex. All the scaffolding needs to be arranged by the vendor.

iii. All the digging work should be done manually. However in some places JCB may be allowed if there are no services near the vicinity but not a mandatory. Engineer incharge will give the clearance.

iv. The equipment shall be installed, tested, demonstrated, and commissioned to the satisfaction with all the features and functions.

v. Drawings such as overall general layouts, controls, field wiring diagrams etc shall be sentfor purchaser's approval before installation.

vi. Installation and configuration of items should be done as per the instructions of **BARC, Tarapur**.

1.	**SYSTEM DESCRIPTION**
	• The Fiber Optic Network based Video Surveillance system consists of fixed cameras andPan Tilt Zoom (PTZ) cameras, servers, work stations, ethernet switches etc. All cameras shall be of IP based and thus can directly connect to the network. The IP cameras (both fixed and PTZ) shall be installed at various locations of BARC, Tarapur. Allthese cameras are connected to the control room via fiber optic cable.The video streaming from all the cameras or the selected cameras shall be stored on tothe server. The capacity of the storage system shall bedesigned such that the storage of all the cameras shall be possible for a minimum period of three months or 90 days.
1.1	**GENERAL REQUIREMENTS OF THE SYSTEM**
1.1.1	**Operating Conditions:**
	Temperature range :0°C to 60°C Humidity : 60 to 96% RH (non-condensing)
1.1.2	**GENERAL FEATURES & REQUIREMENTS**
	a. The power supply available to the electrical loads of the system is 240 VAC ±10%, 50Hz ±3%. b. The cameras shall be tamper-proof and shall alarm during tampering, and shall log the event to the main database and shall be plug in type with suitable lockingdevices. c. The Video Management software shall be user friendly and menu driven with self checking i.e. all the

routines shall be checked periodically for their properfunctioning and integrity.

d. Diagnostic checks shall be done by the system periodically for the properfunctioning of the video cameras.
e. All the ethernet switches and other electronic units used in outdoor environmentshall be housed inside a cabinet with natural cooling arrangement. If cooling is insufficient to remove the heat generated, then proper cooling arrangement shall be provided for proper functioning of electronic units.
f. The network shall be conceived to achieve a bandwidth of 1 Gbps. The biddershall engineer the scheme and t he same shall be submitted along with the offer.
g. A proper earthling system comprising earth pit, joints, earth rods, clamps, earth bars, flexible copper braid bonds, eye bolts, crimp connectors and associated accessories shall be designed as per IS 3043.
i. Necessary concrete foundation shall be made to erect the pole and mount the camera on the poles.
j. All the cables (power and signal cables) shall be routed through the HDPE conduits.
k. Road cutting to a depth of 300 mm and laying of ISI certified GI conduits is required to route the fiber optic cables and powercables across the road. Wherever the road cutting is done, the cut portion shouldbe repacked with concrete.
l. The software shall be provided to meet all the requirements as mentioned in the technical specifications. It shall be possible for up-gradation of maximum of 30 % in terms of enhancing the number of cameras as and when required. Hence, the design of the software shall have all these features.
m. VMS and cameras shall be of same brand OR EQUAVALENT / manufacturer.
n. The entire Fiber Optic Network based Video Surveillance system shall be adaptable for future up-gradation/addition/deletion of the constituent sub-systems.
o. Software pertaining to VMS and Operating system of computer systems shall be supplied in DVD form with latest service packs.

1.2 TECHINCAL SPECIFICATIONS AND QUANTITIY REQUIREMENT

1 - Supply of IP (POE) based pole mountable camera with accessories | **Qty- 117 Nos.**

Sr. No.	Particulars	Specifications
a.	**Image sensor**	1/2.9 inch or 1/1.8 inch CMOS sensor or higher
b.	**Lens**	3.2 mm-10mm or more
		Wide: 89° x 47°or better
		Tele: 30° x 17°or better
		Autofocus, auto-iris, automatic day/night
c.	**Day and night**	Day/night performance 30 mtr IR or more, switchable
d.	**Minimum illumination**	Color: 0.379 lx , at 30 IRE F1.4or better
		B/W: 0.04 lux at 30 IRE F1.4 or better
		0 lux with IR illumination on
e.	**Shutter speed**	1/10,000 sec ~ 1 sec or better
f.	**Video compression**	H.265; H.264; M- JPEG
g.	**Resolution**	2560x1440 or more
h.	**Frame Rate**	25 fps or better in all resolutions
i.	**Video streaming**	H.264/H.265 and Motion JPEG
		H.264,H.265 and intelligent compression
		Controllable frame rate and bandwidth
		VBR/ABR/MBR H.264/ Intelligent streaming
j.	**Image settings**	Saturation, contrast, brightness, sharpness, Forensic HDR: Up to120 dB depending on scene, defogging, white balance, day/night, compression, mirroring of images, privacy masks
		Scene Rotation 0 degree and 90 degree or better
		Minimum 4 scene profile
k.	**Audio streaming**	Full-duplex / half duplex
l.	**Audio encoding**	AAC-LC 8/16/32/48 kHz, G.711 PCM 8 kHz, G.726 ADPCM 8 kHz, Opus 8/16/48 kHz, LPCM Configurable bit rate
m.	**Audio**	Audio IN/OUT
n.	**Security**	Password protection, HTTPS encryption,
		IEEE 802.1x (EAP-TLS)a network access control, digest Authentication,

		firmware.
o.	**Supported Protocols**	IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/RTCP, IGMP V2/V3, ICMP, ICMPv6, RTSP, FTP, ARP, DHCP, APIPA (Auto-IP, link local address), NTP(SNTP), SNMP (V1, V3, MIB-II), 802.1x, DNS,DNSv6, DDNS, SMTP, UPnP (SSDP),DiffServ (QoS), LLDP, SOAP, digest authentication
p.	**Application Programming Interface**	Open API for software , ONVIF Profile G, ONVIF Profile S, and ONVIF Profile T
q.	**Additional functions**	Privacy Masking- Eight independent areas, fully programmable Display stamping -Name, Logo, Time; Alarm message Pixel counter -Selectable area
r.	**Onscreen Controls**	Day/night shift, Defogging
		Wide dynamic range, IR illumination
s.	**Features**	Rule based alarms and tracking, Line crossing, Enter / leave field, Follow route, Loitering, Idle / removed object, People counting, Crowddensity estimation, 3D tracking
t.	**Event actions**	Pre and post-alarm video buffering
u.	**Video Function-Enhancement**	• Sharpness -Sharpness enhancement level selectable • Backlight compensation- On/off • Contrast enhancement On/off • Noise reduction Intelligent Dynamic Noise Reduction with separate temporal and spatial adjustments a. Intelligent defog- Intelligent Defog automatically adjusts parameters for best picture in foggy or misty scenes (switchable)
v.	**Casing**	IP 66/ NEMA 4x
w.	**Impact protection**	IK 10 outdoor external housing
x.	**Power**	Power over Ethernet (PoE), POE IEEE 802.3af /802.3 at Type 1,Clas 3
		12 VDC ±30%
y.	**IR illumination**	External IR with power-efficient, long-life 850 nm IR LED's with adjustable angle of illumination and intensity
aa.	Edge Storage	Industrial Grade 512 GB or more capacity edge storage using micro SDXC/SDHC card shall be provided with indivisual camera.
bb.	**Warranty**	5-year warranty

2. Installation, testing & commissioning of Item no.1	**Qty- 97 Nos**

Cameras are to be installed with its accessories by the vendor at locations as decided by Engineer In-charge. The work including drilling, hammering or fitting and any other such mechanical and electrical work must be under the scope of vendor. The network cable used for termination of network on camera must be routed properly in flexible conduit inside the pole till JB on pole. Cable routing, laying and termination is in scope of vendor.

a. All connector like RJ-45, LC-SC patch cord installation etc required to complete the system is in Vendor's scope.

b. Camera view is to be adjusted such that the picture is of good quality.

c. All camera cable should be tagged by metallic tag on JB side of cable means near to camera and near to switch. All camera should be tagged with metallic tag mentioning camera number.

d. All cameras should be installed in a way that there should not be any blind Zone.

e. Line crossing alarm, motion detection zone and alarm shall be configured for all cameras.

f. In case of failure of Ethernet connectivity camera footage should be stored in edge storage means 512 GB or more capacity industrial grade micro SDXC/SDHC card. After restoration of Ethernet connection recording of camera should automatically transfer to CCTV server. This point is required to be demonstrated at the time of commissioning.

3. Supply of IP (POE+) based Day & Night HD PTZ camera, with pole/wall mountable accessories	**Qty- 20 Nos**

Sr. No.	**Particulars**	**Specifications**
a.	**Image sensor**	1/2.8" progressive scan CMOS or better

b.	**Lens**	4.3-7 to 129-198mm, F1.5 -F4.8
c.		Autofocus, auto iris
d.	**Day and night**	IR cut filter
e.	**IR Illumination**	Minimum 280 meters or better
f.	**Minimum illumination**	Color 0.2 and B/W 0.01 or better, 30 IRE F1.6
g.	**Shutter speed**	2s to 1/66500 sec or better
h.	**Pan/Tilt/Zoom**	Pan: 360° endless, 0.1°–120°/s or better Tilt 0.1°–60°/s or better, ᴛilt (default): -90° to +45°, Tilt (inverted a): -45° to +90° Tilt speed: 0.05°/s to 60°/s min 30x optical and min 12x digital zoom, 256 preset, minimum two tours, adjustable zoom speed, default position
i.	**Video compression**	H.264, H.265 and MJPEG
j.	**Resolution**	1920X1080p and lower
k.	**Frame rate**	Min 25 fps at all resolution
l.	**Video streaming**	Three configurable streams in H.264/H.265 and Motion JPEG
		H.264, H.265 and MJPEG, bitrate optimization
m.	**Image settings**	Manual shutter time, color, brightness, sharpness, white balance, exposure control, rotation: 0°, 180°, text and image overlay, privacy masks, electronic image stabilization (EIS), PTZ control, automatic defog, backlight compensation, scene profiles Wide Dynamic Range (WDR): Up to 120 dB depending on scene, backlight compensation.
n.	**Supported protocols**	IPv4, IPv6,TCP, HTTP, HTTPS, RTP/RTCP, RTSP, FTP, DHCP, NTP (SNTP),SNMP (V1, V3, MIB-II), 802.1x, DNS, DNSv6, DDNS (DynDNS.org, selfHOST.de, no-ip.com), SMTP, digest authentication
o.	**Application ProgrammingInterface**	Open API/SDK availability, ONVIF Profile G, ONVIF Profile S and ONVIF Profile T,
p.	**Event conditions**	Tampering
		I/O: manual trigger, virtual input
		PTZ movement
		Scheduled and recurring: scheduled event
		Video: live stream
q.	**Data streaming**	Event data / Video Analytics data
r.	**Object Analytics**	Trigger conditions: line crossing, object in area, loitering, idle/remove object, counter, occupancy, crowd detection analytics on presets.
s.	**Casing**	IP66, IK10 or better. Long life silicon wiper/ External wiper
t.	**Sustainability**	Housing: Aluminium
u.	**Power**	24 VAC/IEEE802.3at, Type 3 standard
v.	**Connectors**	RJ45 10/100 Base-T
w.	**Storage**	Industrial Grade 512 GB or more capacity edge storage using micro SDXC/SDHC card shall be provided with indivisual camera.
x.	**Included accessories**	Connector (IP66), Sunshield
y.	**Warranty**	5-year warranty on fixed parts

4. Installation, testing & commissioning of Item no.3	**Qty- 15 Nos**

Cameras are to be installed with its accessories by the vendor at locations as decided by Engineer In-charge. The work including drilling, hammering or fitting and any other such mechanical and electrical work must be under the scope of vendor. The network cable used for termination of network on camera must be routed properly in flexible conduit inside the pole till network switch. Cable routing, laying and termination is in scope of vendor.

a. All connector like RJ-45, LC-SC patch cord installation etc required to complete the system is in Vendor's scope.

b. Camera view is to be adjusted such that the picture is of good quality.

c. All camera cable should be tagged by metallic tag on JB side of cable means near to camera and near to switch mentioning camera no. and switch port. All camera should be tagged with metallic tag mentioning camera

	number.	
d.	All cameras should be installed in a way that there should not be any blind Zone.	
e.	Supplier shall demonstrate and configure the preset and tour as per site requuierment.	
f.	Line crossing alarm, motion detection zone and alarm shall be configured for all cameras.	
g.	In case of failure of Ethernet connectivity camera footage should be stored in edge storage means 512 GB or more capacity industrial grade micro SDXC/SDHC card. After restoration of Ethernet connection recording of camera should automatically transfer to CCTV server. This point is required to be demonstrated at the time of commissioning.	
5.	**Supply of Indoor Dome Camera with mounting accessories**	**Qty- 12 Nos**
Sr. No.	**Particulars**	**Specification**
a.	**Image sensor**	1/2.8" CMOS sensor or better
b.	**Lens**	Varifocal, 3.2–10 mm, F1.6 or better
		Horizontal field of view Wide: 89° x 47° (H x V)or more
		Vertical field of view Tele: 30° x 17° (H x V)or more
		DC Iris control
c.	**Day and night**	IR filter
d.	**Minimum illumination**	Color 0.379 lx , Mono 0.042 lx orbetter
		0.5 lux mono at 30 IRE
		0 lux with IR illumination on
e.	**Shutter time**	Automatic Electronic Shutter (AES); Fixed (1/25[30] to 1/15000) selectable or better
f.	**Video Resolution**	H.264 , H.265 ,MJPEG or better, 1920X1080p or more
g.	**Frame rate**	25 or 30 frames/s
h.	**Video streaming**	Three configurable streams in H.264/H.265 and Motion JPEG, H.264/H.265
i.	**Multi-viewstreaming**	intelligent streaming
j.	**Image settings**	Saturation, contrast, brightness, backlight compensation , Image mirror, Image flip, Pixel counter, Display stamping
k.	**Audio streaming**	Two way audio
l.	**Audio encoding**	G.711/AAC-LC
		Configurable bit rate/intelligent streaming
m.	**Audioinput/output**	Audio IN/OUT
n.	**Security**	HTTPS, onboard Trusted Platform Module (TPM) and Public Key Infrastructure (PKI) support
o.	**Supportedprotocols**	IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/ RTCP, IGMP V2/V3, authentication, firmware
p.	**Application Programming Interface**	ONVIF Profile S; ONVIF Profile G; ONVIF Profile T
q.	**Features**	Day/night shift, Defogging , Wide dynamic range
r.	**Data streaming**	Event data / Video Analytics data
s.	**Built-in installation aids**	Pixel counter Selectable area , Motorized zoom/focus
t.	**Object classes and Trigger conditions**	Pixel counter Selectable area , Motorized zoom/focus Analysis type : Essential Video AnalyticsFeatures : Rule based alarms and tracking, Line crossing, Enter / leave field, Follow route, Loitering, Idle / removed object, People counting, Crowd density estimation, 3D tracking
u.	**Casing**	Aluminium housing, IP66/ NEMA 4X and IK10
v.	**Power**	PoE IEEE standard IEEE 802.3af (802.3at Type 1), Class 3
w.	**Connectors**	Ethernet 10/100 Base-T
x.	**IR illumination**	850 nm IR LED Range of reach 30 meters or better
		Range of reach 30 m or more depending on the scene

y.	**Storage**	Industrial Grade 512 GB or more capacity edge storage using micro SDXC/SDHC card shall be provided with indivisual camera.
z.	**Approvals**	UL / TPM (Trusted Platform Module) , CE, FCC, BIS
aa.	**Warranty**	5 year warranty or better

6. Installation, Testing and commissioning of Item No 5	**Qty- 10 Nos**

Cameras are to be installed with its accessories by the vendor at locations as decided by Engineer In-charge. The work including drilling, hammering or fitting and any other such mechanical and electrical work must be under the scope of vendor. The network cable used for termination of network on camera must be routed properly in flexible conduit inside the pole till network switch. Cable routing, laying and termination is in scope of vendor.

a. All connector like RJ-45, LC-SC patch cord installation etc required to complete the system is in Vendor's scope.

b. Camera view is to be adjusted such that the picture is of good quality.

c. All camera cable should be tagged by metallic tag on JB side of cable means near to camera and near to switch. All camera should be tagged with metallic tag mentioning camera number.

d. All cameras should be installed in a way that there should not be any blind Zone.

e. Line crossing alarm, motion detection zone and alarm shall be configured for cameras.

f. In case of failure of Ethernet connectivity camera footage should be stored in edge storage means 512 GB or more capacity industrial grade micro SDXC/SDHC card. After restoration of Ethernet connection recording of camera should automatically transfer to CCTV server. This point is required to be demonstrated at the time of commissioning.

7. Supply of Digital Input output module for integration of proposed IP CCTV and exiting Electric Fence system	**Qty- 15 Nos**

Sr. No.	**Particulars**	**Specification**
a)	**I/O Interface**	8 configurable I/O ports, Input ports: min 0V DC max 5V DC Output ports: Relay output 50v , 1A
b)	**I/O functionality**	Input trigger, output toggle/pulse
c)	**Security**	Password protection, IP address filtering, HTTPS encryption, IEEE 802.1X network access control, digest authentication, user access log
d)	**Application Programming**	Open API for software integration
e)	**Alarm triggers**	With external inputs
f)	**Casing**	Metal casing. Standalone or wall mount
g)	**Power**	8-34 V DC, max. 8.2 W or20-24 V AC, max 13.7 VA orPOE
h)	**Connectors**	RJ-45 10BASE-T/100BASE-TX PoE

8. Installation, testing & commissioning of Item No 7	**Qty- 10 Nos**

Installation, testing and commissioning of Item no7 is Implementation of Intrusion detection and alarm system, based on CCTV camera Video Analytics and Integration of existing Electric security fencing with CCTV software and implementation of intrusion detection and alarm system based on electric fencing and IP Based Intrusion alarm announcement system and interfacing with CCTV and electric fence based intrusion detection system. Existing installed electric fencing energizer will generate potential free alarm contacts for intrusion in zone, same alrm is required tobe communicated to CCTV server via these IO extender. Required supplying and laying of Cat-6 cable, power cable and signal cable is in the scope of supplier.

9. Supply of Fish Eye Camera with mounting accessories		**Qty- 5Nos**
Sr. No.	**Particulars**	**Specification**
a	Image sensor	4 x 1/2.7" CMOS sensor or better
b	Lens	Verifocal, 3.5-6mm or more, F1.9
		4 x 5MP lens or better
		Horizontal field of view: 85.1º x 62º (H x V) or more
		Vertical field of view: 38.7º x 29.0º (H x V)
		Motorized focus, motorized zoom
c	Day and night	Automatically removable infrared-cut filter
d	Minimumillumination	Color:0.091 lx ,Mono 0.012 lx ,With IR 0 lx
e	Shutter time	1/30 to 1/15000 sec or less
f	Videocompression	H.264, H.265 and MJPEG
g	Resolution	4x 2560x1440 (4 x QHD 1440p) to 640x360and lower
h	Frame rate	Upto 30 fps
i	Video streaming	Three configurable streams in H.264/H.265 and Motion JPEG
j	Audioinput/output	Two way audio
k	IP address	One IP address for all channels
l	Security	HTTPS, onboard Trusted Platform Module (TPM) and Public Key Infrastructure (PKI) support. The advanced certificate handling offers: • Self-signed unique certificates automatically created when required • Client and server certificates for authentication • Client certificates for proof of authenticity • Certificates with encrypted private keys
m	Supportedprotocols	IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/ RTCP, IGMP V2/V3, authentication, signed firmware
n	ApplicationProgramming&Interface	ONVIF Profile G, ONVIF Profile S and ONVIF Profile T
o	Analytics	Object in field, Line crossing, Enter /leave field, Loitering, Follow route, Idle /removed object, Counting, Occupancy, Crowddensity estimation
p	Event triggers	analytics, connection
q	Built-ininstallation aids	Remote focus, Remote zoom
r	Casing	IP66 and IK10
s	Power	30 W (PoE 802.3at Type 2 Class 4 / 24 VAC ±10%)
t	Connectors	10/100/1000 Base-T
u	IR illumination	850 nm High efficient IR LED range of 15 meters or better
v	Storage	Industrial Grade 512 GB or more capacity edge storage using micro SDXC/SDHC card shall be provided with indivisual camera.
y	Warranty	5-year warranty

10. Installation, Testing and Commissioning of Item No 9	**Qty -3 Nos**

Cameras are to be installed with its accessories by the vendor at locations as decided by Engineer In-charge. The work including drilling, hammering or fitting and any other such mechanical and electrical work must be under the scope of vendor. The network cable used for termination of network on camera must be routed properly in flexible conduit inside the pole till network switch. Cable routing, laying and termination is in scope of vendor.

a. All connector like RJ-45, LC-SC patch cord installation etc required to complete the system is in Vendor's scope.

b. Camera view is to be adjusted such that the picture is of good quality.

c.	All camera cable should be tagged by metallic tag on JB side of cable means near to camera and near to switch. All camera should be tagged with metallic tag mentioning camera number.	
d.	All cameras should be installed in a way that there should not be any blind Zone.	
e.	Line crossing alarm, motion detection zone and alarm shall be configured for all cameras.	
f.	In case of failure of Ethernet connectivity camera footage should be stored in edge storage means 512 GB or more capacity industrial grade micro SDXC/SDHC card. After restoration of Ethernet connection recording of camera should automatically transfer to CCTV server. This point is required to be demonstrated at the time of commissioning.	
11.	**Supply of Number Plate Reading camera and software.**	**Qty-3 Nos**

Sr. No.	Particulars	Specifications
a.	Image sensor	1/2.8" inch CMOS or better
b.	Lens	3mm-9mm or better
		Horizontal field of view 33° - 100°or more
		Vertical field of view 19° - 52°or more
		Installation focus, auto-iris, automatic day/night
c.	Day and night	Day/night performance
d.	Minimum	color 0.07 lx, mono 0.01 lux at 30 IRE, F1.4 or better
	Illumination	0 LUX IR ON
e.	Shutter speed	1/30 TO 1/15000 SEC
f.	IR illumination	Night: 20–50 m (66–164 ft)
		Night detection range 50 meter or more
g.	Vehicle speed	Up to 130 km/h (81 mph) with optional edge analyticsUp to 250 km/h (155 mph) with server based analytics
h.	Coverage	Single lane with optional edge analytics, Two lanes with server based analytics
i.	Installation	Mounting height: Up to 10 m (33 ft)
		Distance from road: Up to 10 m (33 ft)
		Camera detects tilt and roll angle automatically
		Edge/Server based license plate detection
j.	Video Compression	H.265; H.264; M- JPEG
k.	Resolution	1920x1080 HDTV 1080p to 160x120
		Recognize 6 M or better
		observe 13 M or better
		Detect 33M or better
l.	Frame rate	Upto30 fps
m.	Video streaming	optimized bit rate
n.	Image settings	Saturation, contrast, brightness, backlight compensation , text overlay
o.	Audio streaming	Two way audio
p.	Audio encoding	G.711/AAC-LC
q.	Audio input/output	Audio In/Out
r.	Security	IPv4, IPv6, UDP, TCP, HTTP, HTTPS, RTP/RTCP, IGMP V2/V3, authentication,
s.	ApplicationProgrammingInterface	ONVIF Profile G, ONVIF Profile S
	Object classes and Trigger conditions	humans, vehicles (types: cars, bikes, truck): line crossing, object in area, loitering, idle/remove object
t.	Data streaming	Event data / Video Analytics data
u.	Built-in	Remote zoom, pixel counter, calibration
v.	Applications	No installation of third party application allowed for data security

w.	Casing	IP66/ NEMA ,IK10 Housing
x.	Power	Power over ethernet POE, 24VAC/12 VDC or better
y.	IR illumination	High efficiency LED, 50 meters
z.	Storage	Industrial Grade 512 GB or more capacity edge storage using micro SDXC/SDHC card shall be provided with indivisual camera.
aa.	Software	Related software with 3 camera license is in the scope of supplier. This software may be standalone or may be integrated with video management software. The software should have facility to enter allowed vehicles registration number and if there is entry of any vehicle other than allowed then it should generate alarm for the same. All vehicles registration mumber through particular lane should be recorded and provision should be there to export the file. Software should also have facility for report generation based on vehicle registration number, from date, to date, all aloowed vehicles and all unallowed vehicles.
bb.	Warranty	5-year warranty

12.	**Installation, Testing and Commissioning of Item NO 11**	**Qty -2 Nos**

Cameras are to be installed with its accessories by the vendor at locations as decided by Engineer In-charge. The work including drilling, hammering or fitting and any other such mechanical and electrical work must be under the scope of vendor. The network cable used for termination of network on camera must be routed properly in flexible conduit inside the pole till network switch. Cable routing, laying and termination is in scope of vendor.

a. All connector like RJ-45, LC-SC patch cord installation etc required to complete the system is in Vendor's scope.

b. Camera view is to be adjusted such that the picture is of good quality.

c. All camera cable should be tagged by metallic tag on JB side of cable means near to camera and near to switch. All camera should be tagged with metallic tag mentioning camera number.

d. All cameras should be installed in a way that there should not be any blind Zone.

e. NPR camers should have facility to generate alarm contact for unallowed vehicle entry.

f. Installation of related software is also in the scope of supplier. Demonstration of different features of the software and configuration of software as per site requirement is in the scope of supplier.

13. Supply of servers	**Qty-2 Nos**

S. No	**Item**	**Description of Requirement**
a.	Chassis	2U Rack Mountable
b.	CPU	4 x Intel Xeon Processor Scalable Family Intel Xeon Gold 5217 (8C, 3.00 GHz, TLC: 11 MB, Turbo: 3.40 GHz, 10.4 GT/s, Mem bus: 2,666 MHz, 115 W, AVX Base 2.50 GHz, AVX Turbo 3.00 GHz)
c.	RAM	Minimum 2 nos of 16 GB RAM
d.	HDD OS	2 X 480GB SSD (Minimum)
e.	HDD for Data	8 X 8TB SAS SSD Drives for storage
f.	Controller	Raid Controller 4GB . Storage controller should support Secure encryption/data at rest Encryption
g.	Network Ports	Integrated 1 Gbps Quad network ports
h.	Interfaces	USB 3.0 support Minimum 5 USB Ports
i.	Bus Slots	4 Nos of PCIe 3.0 X8 slots 2 Nos of PCIe 3.0 X16 slots All Full-height, full-length slot

j.	System Security	FIPS 140-2 validation Support for Commercial National Security Algorithms (CNSA) Secure Recovery – recover critical firmware to known good state on detection of compromised firmware Secure erase of NAND/User data UEFI Secure Boot and Secure Start support Common Criteria certification Advanced Encryption Standard (AES) and Triple Data Encryption Standard (3DES) on browser
k.	Power Supply	Hot plug redundant power supplies
l.	Embedded Remote Management and firmware security	1. System remote management should support browser based graphical remote console along with Virtual Power button, remote boot using USB/CD/DVD Drive. It should be capable of offering upgrade of software and patches from a remote client using Media/image/folder; It should support server power capping and historical reporting and should have support for multifactor authentication 2. Server should have dedicated 1Gbps remote management port 3. Server should have storage space earmarked to be used as a repository for firmware, drivers and software components. The components can be organized in to install sets and can be used to rollback/patch faulty firmware 3. Server should support agent less management using the out-of-band remote management port 4. The server should support monitoring and recording changes in the server hardware and system configuration. It assists in diagnosing problems and delivering rapid resolution when system failures occur 5. Applications to access the server remotely using popular handheld devices based on Android or Apple IOS should be available 6. Remote console sharing upto 6 users simultaneously during pre-OS and OS runtime operation, Console replay - Console Replay captures and stores for replay the console video during a server's last major fault or boot sequence. Microsoft Terminal Services Integration, 128 bit SSL encryption and Secure Shell Version 2 support. Should provide support for AES and 3DES on browser. Should provide remote firmware update functionality. Should provide support for Java free graphical remote console.
m.	Operating System	Windows 2019 servers standard edition or latest licensed OS
n.	DVD Writer	Internal / External DVD writer
o.	Monitor	21.5” Networ rack mountable Monitor with integrated keyboard and mouse
p.	Warranty	3 years onsite warranty

14. Installation, Testing and Commissioning of Item NO 13	**Qty-2 Nos**

A. Servers must be installed at CCTV rack using locking screws.

B. It must be connected to CCTV network via Cat6 cable or suitable cable as per requirement.

C. It must be configured for motion recording with a full HD resolution@25FPS for each camera. Other configurations as per user must be done by the vendor.

D. These servers will be loaded with VMS software. In order to do Load balancing, two servers are planned. VMS

license should be taken in the way that half of the camera will work on one server and other half will work on other server. Two fail over servers (One for each) are also planned, in case of failure of one server fail over server should take care the same.	
15. Supply of Video Management software including 150 channel license	**Qty- 1 Lot**
Technical Specifications:	
a. Enterprise level video, audio and data management system for recording and monitoring	
b. Provides interoperability, security and ease of deployment	
c. The VMS should be a server client Architecture.	
d. The software should support NAS as well as server hard disk for recording and backup of video files	
e. Clients should be web based and with minimum 20 concurrent user license. If it is application based, then bidder should provide user licenses for minimum of 20 users.	
f. The system shall allow for creation of multiple users and user groups and assign rights to each user and group.	
g. VMS software should support other make camera compatible with ONVIF protocol.	
h. SIP based mike and IP based speaker shall also be controlled via VMS software.	
i. The system should allow operation with PC keyboard or mouse. Once system is configured, virtual matrix functions can be carried out using CCTV keyboards.	
j. The system shall allow for live view, playback and system configuration.	
k. It shall be capable of showing video pane layouts including 1x1, 2x2, 3x3, 4X4, 8X8· Software shall support 1+3, 1+5, 1+7, 1+9, 8X8 layout. Software should support 16:9and 4:3 formats and software must support both the formats. Software should support multiple resolutions like Full HD/HD/ ready/1K/4K/Video wall.	
l. System setup for pre-defined surveillance tasks to be invoked at pre-defined times in a day.	
m. Alarm should be classified with regard to the severity of alarm, cause of alarm, and action required like email, auto reset. This should be possible for each alarm.	
n. Different recording schedule for different camera. Camera should be clubbed in a group and the recording can be scheduled for that group.	
o. Backup schedule for the recorded video on a daily/weekly basis including time of start and date/time of end.	
p. Number of days of backup to be retained should also be possible to set from software	
q. Custom Layout: User can program the layout as per his/her need/requirement.	
r. Playback of archived video at variable speed. Retrieval of archived Video using normal playback, thumbnails (event or time based). Software shall allow operator to drag and drop a camera from a tree of available cameras into any video tile analogue monitor icon for live viewing.	
s. For each camera, bit rate, frame rate, and resolution shall be set independent of other cameras in the system. Altering the setting of one shall not affect the settings of other cameras.	
t. The software system shall be capable of handling camera on area maps.	
u. Software should provide the option of generating incident from various sources of alarms like network failure, video loss failure etc.	
v. In case of Ethernet failure, Camera will store the recording in edge storage means SD card at camera, after restoration of the connectivity, VMS should take recordings stored in edge to the VMS.	
w. Edge based alarms generated from video analytics shall be stored in VMS software and report genearation facility should also be there.	
x. VMS software should have features to complete the scope of work as specified at point no.1 of section V of Tender document.	
y. VMS software should also record event generated from Electric fence energisers.	
z. VMS license should be taken in the way that half of the camera will work on one server and other half will work on other server. Two fail over servers (One for each) are also planned, in case of failure of one server fail over server should take care the same.	
16. Installation, testing & commissioning of Item No-15	**Qty- 1 Lot**
The installation should be done as per procedure given by the OEM or EIC.The software shall be capable of monitoring the status of camera in the network and shall indicate when a device goes offline by suitable red cross across the camera.	
a. Software should support graphical representation of storage status.	
b. Report Generation: The software should be able to generate report from different sources:	
c. Camera status	
d. HDD consumption of server	
e. Software should have inbuilt and easy to understand graphical representation such as pie chart, histogram, and tabular format.	
f. Video Search: The software should allow search based on time, date, and day.	
g. Search result display should happen in three ways:	

✓ Thumbnail	
✓ Timeline	
✓ List view	
The supplier shall provide the snapshots of the features available in the VMS offered·	
Demo version of the VMS may be supplied to the purchaser on demand while evaluating the technical suitability of the offer.	

17. Supply of Work station computer		**Qty- 10 Nos**
S. No	**Features**	**Qualifying Minimum Requirements**
a.	Processor	Intel Xeon W-3235 3.3 2933MHz 12C or better
b.	Chipset	Intel C622 or better compatible with processor
c.	RAM	2 nos. of 8 GB ECC, DDR4, 2666 MHz memory or heigher capacity; 6 channel Memory support with Total 12 DIMM Slots with 2 CPU's
d.	Drive Controllers	Onboard 6-Channel SATA @ 6Gb/s (RAID 0,1,and NCQ)
e.	Hard Disk	512GB SSD Drive for OS. 2 nos. of 1 TB SSD Drives for Data Option for future expansion of additional 3 Hard drives.
f.	Optical Drive	9.5mm Slim SuperMulti DVD Writer
g.	Graphics Card	NvidiaQuadro P1000 Graphic card with 4GB memory or higher version
h.	Monitor	Minimum 21.5 Inch LED monitor
i.	Bays	2 x External 5.25’’ 2 x Internal 2.5" / 3.5’’ 2x M.2PCIe Gen 3 x4 Slots Slim Optical Drive bay
j.	Slots	2 x PCIe x16 Gen3 3 x PCIe x4 Gen3 1 x PCIe x8 Gen3 All PCIe slots should be open-ended.
k.	Security	BIOS controlled electro-mechanical internal chassis lock for the system.
l.	Ports	**Front I/O:-**Power button, 1 Headset audio port, 4 USB 3.1 G1 Type A (1 charging) **Rear I/O:-** 6 USB 3.1 G1 (aka USB 3.0) Type A ports, 2 1Gbe LAN ports(1x supporting AMT) , Audio: 1 Line out, 1 Line in, 1 PS/2 mouse port, 1 PS/2 keyboard port, 1 Rear power button, 1 Serial port
m.	Keyboard and Mouse	Minimum 104 keys USB Keyboard and USB Optical Scroll mouse - Same make as that of the workstation
n.	Monitor	24” Monitor with HDMI connection or higher size with inbuilt speaker
o.	Audio	High Definition Integrated Audio with Internal speaker.
p.	Power Supply	Hot plug redundant power supplies
q.	Chassis	Completely tool less chassis with handles in front and rear side. Provision for Kensington lock and Panel lock required. Integrated handles on the chassis. System should be rack-mountable.
r.	Operating System	Windows 10 Pro or latest version OS. System should be certified for running RHEL and SLED.
s.	Remote Collaboration Solution	Hardware or Software based Remote Collaboration system which can help remotely access 3D data across network has to be supplied with the system. - It should allow collaboration between multiple participants on an OpenGL 3D or DirectX applications. - It should support One to One for remote work and One to many for collaboration with keyboard and mouse control. - Application should be stateless and should not transfer actual data over the network. - Pixel information or images should be 128 SSL encrypted. - Should work on both Linux and Windows, and should be inter-operable.

t.	Additional Software	1. The hardware vendor should supply an automatic system performance tuning and monitoring software on Windows. 2. The tuning software should have modules for resource monitoring over a long period of time, and should be capable of showing GPU utilization (GPU, Graphics memory and Codec activity) for both Graphics and GPU Compute cards. 3. A complete Offline Diagnostics and Asset Discovery software suite should be supplied along with the system.

18. Installation, testing & commissioning of Item No-17	**Qty- 10 Nos**
All related softwares, operating system and Key has to be preinstalled before dispatch to the site. All commissioning type of activities will be completed at site.	

19. Supply of 24port Layer2 Managed Switch	**Qty- 3 Nos**

Sr.No		**Minimum Specifications**
a.	General	24 Combo Copper/SFP+ 10G ports with one expansion slot Console Port • RJ-45 console port for out-of-band management Port • 10/100/1000 BASE-T RJ-45 Ethernet for out-of-band remote management
		Port Standards & Functions: IEEE 802.3 10BASE-T Ethernet IEEE 802.3u 100BASE-TX Fast Ethernet, IEEE 802.3ab 1000BASE-T Gigabit Ethernet, 802.3ae 10 GbE, IEEE 802.3x Flow Control for Full-Duplex Mode, IEEE 802.3af/at compliance (for PoE ports)
		Should support IEEE 802.3az Energy Efficient Ethernet.
b.	Performance	40 Gbps of stacking bandwidth per switch using front panel 10G SFP+ ports 160 Gbps of stacking bandwidth per switch usingoptional AT-Stack QS expansion module 13 KB L2 and 9KB L3 Jumbo frames Wire speed multicasting 4094 configurable VLANs Up to 64K MAC addressesနှင့်Up to 16,000 OSPF routes Up to 2K IPv4 multicast entriesနှင့်Up to 2000 Open Flow v1.3 entries Up to 128 Link Aggregation Groups (LAGS) - anycombination of static and dynamic (LACP) 2 GB DDR SDRAM, 256MB flash memory Packet buffer memory: x930-28 - 2MB, 52 - 4MB
c.	PoE Standard	Should support - IEEE 802.1AE Media Access Control Security (MACSec) IEEE 802.2 Logical Link Control (LLC) IEEE 802.3 Ethernet IEEE 802.3ab 1000BASE-T, IEEE 802.3ae 10 Gigabit Ethernet, IEEE 802.3af Power over Ethernet (PoE), IEEE 802.3an 10GBASE-T, IEEE 802.3az Energy Efficient Ethernet (EEE), IEEE 802.3ba 40GBASE-X, IEEE 802.3u 100BASE-X, IEEE 802.3x Flow control - full-duplex operation, IEEE 802.3z 1000BASE-X, IEEE 1588v2 Precision clock synchronization protocol v2
d.		Ports 1 to 24 must all be PoE capable
e.		Should support up to 190W or more PoE power budget.
f.	L2 Features	Should support HOL Blocking Prevention for flow control.
		Should support Jumbo Frame up to 9000 Bytes.
		Should support IGMP v1/v2 Snooping, IGMP v3 awareness, 512 IGMP groups and Host-based IGMP Snooping Fast Leave.
		Should support MLD v1/v2 awareness, 512 MLD groups, Per VLAN MLD Snooping and Host- based MLD Fast Leave.
		Should support 802.1D STP, 802.1w RSTP and 802.1s MSTP Spanning Tree Protocol.
		Should support Loop Back detection.

		Should support Multicast Filtering for filters all unregistered groups.
g.	VLAN	Generic VLAN Registration Protocol (GVRP)
		IEEE 802.1ad Provider bridges (VLAN stacking, Q-in-Q), Generic VLAN Registration Protocol (GVRP) IEEE 802.1Q Virtual LAN (VLAN) bridges IEEE 802.1v VLAN classification by protocol and port
		IEEE 802.3ac VLAN tagging
		Should support Asymmetric VLAN
		Should support Auto Voice VLAN
		Should support Auto Surveillance VLAN
h.	Quality of Service (QoS)	Should support IEEE 802.1p Priority tagging RFC 2211 Specification of the controlled-load network element service, RFC 2474 DiffServ precedence for eight queues/port RFC 2475 DiffServ architecture RFC 2597 DiffServ Assured Forwarding (AF) RFC 2697 A single-rate three-color marker RFC 2698 A two-rate three-color marker RFC 3246 DiffServ Expedited Forwarding (EF)
i.	Access Control List (ACL)	Should support ACL based on 802.1p priority, VLAN, MAC address, Ether type, IP address, DSCP, Protocol type, TCP/UDP port number, DSCP of IPv6 Traffic Class and IPv6 flow label.
		Should support Time-based ACL
j.	Security	Should support SSH remote loginSSLv2 and SSLv3TACACS+ Accounting, Authentication and Authorization(AAA)IEEE 802.1X Authentication protocols (TLS, TTLS, PEAPand MD5), IEEE 802.1X Multi-supplicant authentication. IEEE 802.1X Port-based network access control X.509 Online Certificate Status Protocol (OCSP) HTTP over TLS (“HTTPS”), RADIUS authentication ,RADIUS accounting, RADIUS attributes for tunnel protocol support PKCS #10: certification request syntax specification v1.7 Transport Layer Security (TLS) extensions RADIUS support for Extensible Authentication Protocol (EAP) IEEE 802.1x RADIUS usage guidelines PPP Extensible Authentication Protocol (EAP) Secure Shell (SSHv2) protocol architecture Secure Shell (SSHv2) authentication protocol Secure Shell (SSHv2) transport layer protocol Secure Shell (SSHv2) connection protocol Transport Layer Security (TLS) v1.2 X.509 certificate and Certificate RevocationList (CRL) profile Transport Layer Security (TLS) transportmapping for Syslog Elliptic curve algorithm integration for SSH Domain-based application service identity within PKI using X.509 certificates with TLS Transport Layer Security (TLS) encryption for RADIUS SHA-2 data integrity verification for SSH
k.	Management	Should support Web-GUI, CLI and Telnet.
		Should support IPv6 Neighbor Discovery.
		Should support SNMP v1, v2c, v3, SNMP Traps and RMON.
		Should support dual Image
		Should suport ICMPv6 and IPv4/v6 Dual Stack.
		Should support LLDP and LLDP-MED.

20. Installation, testing & commissioning of Item No-19	**Qty- 3 Nos**
a. Layer-2 network switch must be installed inside network rack using locking screws.	
b. Camera Ethernet connections must be terminated on switch thru CAT 6 cable. All connector like RJ-45, LC connector patch cord etc. required to complete the system is in Vendor's scope.	
c. Tagging of all cables using either metal or plastic tags is in scope of vendor.	
d. Configuration of IP address, IP-Mac binding of all connected devices, SNTP setting configuration, RSTP configuration and testing.	
21. Supply & Installation of 8TB HDD Surveillance hard disks compatible with above Server	**Qty- 12 Nos**

Sr. No.	**Particulars**	**Specifications**
a.	Formatted Capacity	8TB or more
b.	Form factor	2.5 inch
c.	RoHS complaint	Yes.
d.	Cameras supported	60 nos. or more
e.	Interface transfer rate Buffer to host	6 Gb/s or more
f.	Interface transfer rate Host to/from drive	175Mb/s or more
g.	Interface Type	SATA
h.	Performance (Sequential Read)(MB/s)	550 or more
i.	Performance (Sequential write)(MB/s)	500 or more
j.	MTBF	10,00,000 hours or more
k.	Total Bytes Written (TBW)	150TB or more
l.	Warranty	5 years or more

22. Supply of Network switch-12 port, POE+, Giga port managed Layer 2 with two Bi-Di SFP port	**Qty- 30 Nos**

Sr. No		**Minimum Requirement**
a.	General	Number of Ports: 08*10/100/1000 Mbps BASE-T PoE Capable • 2 x 10/100/1000BASE-T ports • 2 x SFP ports • 1 x RJ-45 Console port

		Port Standards & Functions: IEEE 802.3 10BASE-T Ethernet (twisted-pair copper) IEEE 802.3u 100BASE-TX Fast Ethernet (twisted-pair copper) IEEE 802.3u 100BASE-FX 100 Mbps over fiber optic IEEE 802.3ab 1000BASE-T Gigabit Ethernet (twisted- pair copper) IEEE 802.3z 1000BASE-X 1 Gbps over fiber optic IEEE 802.3az Energy Efficient Ethernet (EEE) IEEE 802.3x Flow Control IEEE 802.3af/at compliance
b.	Performance	128MB RAM 16MB flash memory 8,192 MAC addresses 4094 VLANs Packet buffer memory:
c.	PoE Standard	Should support IEEE 802.3 – 10T IEEE 802.3u – 100TX with auto-negotiation IEEE 802.3ab – 1000T Gigabit Ethernet 100FX SFP support 1000X SFP support
d.	Support	RFC 894 Ethernet II encapsulation IEEE 802.1D MAC bridges IEEE 802.1Q Virtual LANs IEEE 802.2 logical link control IEEE 802.3ab 1000T IEEE 802.3ad (LACP) link aggregation IEEE 802.3u 100TX IEEE 802.3x full-duplex operation IEEE 802.3z Gigabit Ethernet
e.	Should support up to 65W or more PoE power budget.	
f.	Switch should support port,ip and Mac binding.	
g.	Compliance Standards	IEEE 802.3 – 10T IEEE 802.3u – 100TX with auto-negotiation IEEE 802.3ab – 1000T Gigabit Ethernet 100FX SFP support 1000X SFP support
h.	Port Configuration	Auto-negotiation, duplex, MDI/MDI-X, IEEE 802.3x flow control/ back pressure Head of Line (HOL) blocking prevention Broadcast storm control Broadcast, multicast, unknown unicast rate limiting Port mirroring Ethernet statistics Redundant master/slave management
i.	L2 Features	Should support HOL Blocking Prevention for flow control.
j.		Should support Jumbo Frame up to 9000 Bytes.
k.		Should support IGMP v1/v2 Snooping, IGMP v3 awareness, 256 IGMP groups and Host- based IGMP Snooping Fast Leave.
l.		Should support MLD v1/v2 awareness, 256 MLD groups, Per VLAN MLD Snooping and Host- based MLD Fast Leave.
m.		Should support 802.1D STP, 802.1w RSTP and 802.1s MSTP Spanning Tree Protocol.
n.		Should support Loop Back detection.
o.		Should support Multicast Filtering for filters all unregistered groups.
p.	VLAN	Should support 802.1Q Tagged VLAN
q.		Should support 4K VLAN and VLAN Group • Max. 256 static VLAN groups Configurable VID from 1 - 4094

r.		Should support GVRP
s.		Should support Asymmetric VLAN
t.		Should support Auto Voice VLAN
u.		Should support Auto Surveillance VLAN
v.	Quality of Service (QoS)	Should support IEEE 802.1p QoS Eight priority queues Strict priority and weighted round robin DSCP Rate limiting Voice VLAN
		Should support 802.1p Quality of Service with 8 queues per port.
		Should support Queue Handling with Strict Priority Queue, Weighted Round Robin.
w.	Access Control List (ACL)	Should support ACL based on 802.1p priority, VLAN, MAC address, Ether type, IP address, DSCP, Protocol type, TCP/UDP port number, DSCP of IPv6 Traffic Class and IPv6 flow label.
		Should support Time-based ACL
x.	Security	Should support Layer 2/3/4 permit/deny/mirror ACLs, SSHv2,SSLv3,RFC 2865 Radius, RFC 1492 TACACS+, Port security (limited/dynamic) IEEE 802.1x port base, IEEE 802.1x multiple host mode, IEEE 802.1x supplicant, IEEE 802.1x authenticator, IEEE 802.1x MD-5, IEEE 802.1x LEAP, IEEE 802.1x PEAP, IEEE 802.1x EAP-TLS, IEEE 802.1x TTLS IEEE 802.1x dynamic VLANs, IEEE 802.1x guest VLANs, IEEE 802.1x secure VLANs, IEEE 802.1x multiple supplicant mode, IEEE 802.1x piggy-back mode, IEEE 802.1s MSTP, Per-port MAC address limiting Per-port MAC address filtering, Per-port MAC address lockdown Microsoft NAP compliant, Symantec NAC support
y.	Management	Should support Web-GUI, CLI and Telnet
		Should support IPv6 Neighbor Discovery.
		Should support SNMP v1, v2c, v3, SNMP Traps and RMON.
		Should support dual Image
		Should suport ICMPv6 and IPv4/v6 Dual Stack.
		Should support LLDP and LLDP-MED.

23. Installation, testing & commissioning of Item No-22	**Qty- 3 Nos**
a. Layer-2 network switch must be installed inside network rack using locking screws.	
b. Camera Ethernet connections must be terminated on switch thru CAT 6 cable. All connector like RJ-45, LC connector patch cord etc. required to complete the system is in Vendor's scope.	
c. Tagging of all cables using either metal or rubber tags is in scope of vendor.	
d. Configuration of IP address, IP-mac binding of all connected devices, SNTP setting configuration, RSTP configuration and testing.	
24. Supply of 12 port fully loaded LIU	**Qty- 26 Nos**

Sr.	**Particulars**	**Specifications**

No.		
a.	LIU Features	Fiber optic LIU should include with LIU Box itself, Adapter Panel and Adapters as per requirement.
		Have sufficient slots for accommodate Simplex/duplex 12 number SC adapters individually.
		Should be 1U 19 inch rack mountable.
		Aluminium base material for light mounting.
		Should have Splice Tray & Cable Spool provision inside LIU.
		Accessory kit consists of cable ties; mounting ear screw earthling and spiral wrap tube.
		Panel cover should be slide out for easy maintenance.
		Removable Rear & Front cover for better access to interior of LIU.
		Should have Rubber fiber slotted bracket built-in, metal splice shelf to protect the fibers.
		Should capable of storing up to 3 meters of 900 µm tight buffered fiber per adapter.
b.	Adapter Plate Features	Plate made from Cold Rolled Steel/Aluminium material.
		Suitable for SC adapters
		Adapter Features
		All SC adaptors should be Simplex/Duplex type. Adapters should have compact design & high precision, which perform well under various circumstances & maintain good plug retention strength.
		Should have Telcordia, TIA/EIA and IEC compliance.
		The sleeves are basically recommended zirconia split type, the phosphor bronze split
		Insertion Loss should be ≤ 0.20dB for Zirconia Sleeve
		Sleeve/Ferrule Withdrawal Force should be 2.0N ~ 5.9N for Adapter.

25.	**Installation, testing & commissioning of Item No-24**	**Qty- 25 Nos**

a. The LIU must be installed inside 9U rack using appropriate screws so as it is properly fitted without any loose ends.

b. The splicing of fiber cores pigtails must be done so as to ensure minimum lose at splice.

c. The fiber cores must be properly routed such that it is not damaged during repackaging.

d. Proper termination of patch cords at ports is to be done with respective tagging so that the termination looks clean and neat.

26.	**Supply of 12 Port UTP patch panel**	**Qty- 26 Nos**

Sr. No.	**Particulars**	**Specifications**
a.	Features	Category 6 Patch Panel should be 12 Port 1U size and Mounts in standard 19 inch racks.
		Patch panel should have cable manager for improvement management.

		Patch panel suitable for Category 6 keystone.
		Panel and Support bar material should have PC + Glass Fiber, UL 94V-0, Black Color.
b.	IO Features	Category 6 keystone jacks are RJ45, 8 position 8 contact socket.
		Category 6 keystone jacks are suitable for 22-26 AWG stranded and solid wire.
		Category 6 keystone jacks are compatible with both 110 & Krone punch down tools.
		The Category 6 keystone jacks shall be backward compatible with Category 5e, 5 and 3 cords and cables.
		It supports IEC 60603-7-4 and compliance with ANSI/TIA/EIA 568 C.2 standard.
c.	Performance Characteristics	Insertion force should be 20N maximum (IEC 60603-7-4).
		Current rating should be 1.5A.
		Life of Jack should be 750 cycles minimum (ISO/IEC 11801, IEC 60603-7-4).
		Should have transparent plastic window plate for labels writing.
		Face plate material should be ABS, UL94-HB, with white color
		Suitable Back Box with screw should be supplied to terminate the above face plate.

27. Installation, testing & commissioning of Item No-26	**Qty- 25 Nos**
a. Patch panel must have a size such that it can be easily mounted in a standard 9U rack.	
b. All of the panel ports must be crimped using UTP Cat 6 cable. The other end of cable must be crimped with a RJ-45 connector, for termination at network switch.	
c. All UTP/STP cables must be properly routed and tagged such that it does not cause difficulty in future maintenance.	

28. Supply of 24 port fully loaded LIU		**Qty- 5 Nos**
Sr. No.	**Particulars**	**Specifications**
a	LIU Features	Fiber optic LIU should include with LIU Box itself, Adapter Panel and Adapters as per requirement.
		Have sufficient slots for accommodate Simplex/duplex 24 number SC adapters individually.
		Should be 1U 19 inch rack mountable.
		Aluminium base material for light mounting.
		Should have Splice Tray & Cable Spool provision inside LIU.
		Accessory kit consists of cable ties; mounting ear screw earthling and spiral wrap tube.
		Panel cover should be slide out for easy maintenance.
		Removable Rear & Front cover for better access to interior of LIU.
		Should have Rubber fiber slotted bracket built-in, metal splice shelf to protect the fibers.
		Should capable of storing up to 3 meters of 900 µm tight buffered fiber per adapter.

h	Adapter Plate Features	Plate made from Cold Rolled Steel/Aluminium material.
		Suitable for SC adapters
		Adapter Features
		All SC adaptors should be Simplex/Duplex type. Adapters should have compact design & high precision, which perform well under various circumstances & maintain good plug retention strength.
		Should have Telcordia, TIA/EIA and IEC compliance.
		The sleeves are basically recommended zirconia split type, the phosphor bronze split
		Insertion Loss should be ≤ 0.20dB for Zirconia Sleeve
		Sleeve/Ferrule Withdrawal Force should be 2.0N ~ 5.9N for Adapter.

29. Installation, testing & commissioning of Item No-28	**Qty- 4Nos**

a. The LIU must be installed inside 12U rack using appropriate screws so as it is properly fitted without any loose ends.

b. The splicing of fiber cores pigtails must be done so as to ensure minimum lose at splice.

c. The fiber cores must be properly routed such that it is not damaged during repackaging.

d. Proper termination of patch cords at ports is to be done with respective tagging so that the termination looks clean and neat.

30. Supply, Installation &commissioning of 5Mtr CAT6 Shielded Patch Cord	**Qty- 150 Nos**

Patch Cable should be Unshielded twisted pair 100 Ohms, Multi-strand and Highly Flexible, HDPE insulation over the conductors and PVC jacket overall, Individual cable pairs are separated by a PE former.

a. Shall support 1000MBPS,
b. Yellow in color of length 5 Meter
c. With matching colored snag-less, electrometric polyolefin boot.
d. Terminals with gold plated contacts of 50 micron inch thick gold over nickel.
e. Patchcord has a characteristic impedance of 100 +/- 3 ohms
f. Back-ward-compatibility with all current Cat 6 products and Applications.
g. Guaranteed full duplex Crosstalk values
h. Improved PS –NEXT,ELEFEXT and Return Loss performances
i. Category 6 patch cords with four pair twisted cable terminated with RJ45 modular plugs at both the ends.
j. Patch Cord should have TIA/EIA 568C.2 standards.
k. Category 6 patch cord should be 100% factory made and performance tested.
l. Category 6 patch cord length requires – 5 meter as per require in BOM.

Performance Characteristics

a. Patch cord conductor should be 24 AWG, multi-strands.
b. Patch core conductor metal should be made from bare copper.
c. Insulation material should be high density polyethylene.
d. Heat resistance of patch cord should be 60° Celsius.

Modular Connector/Plug Characteristics

a. Patch cord plug should be gold plated 30U°.
b. Contact blade of plug should be made from phosphor bronze.
c. Bidder Must produce the manufacturer Authorization certificate from the OEM with respect to this Project.

31. Supply, Installation &commissioning of 2 Mtr CAT6 Shielded Patch Cord	**Qty- 100Nos**

Patch Cable should be shielded twisted pair 100 Ohms, Multi-strand and Highly Flexible, HDPE insulation over the conductors and PVC jacket overall, Individual cable pairs are separated by a PE former.

a. Shall support 1000MBPS
b. Yellow in color of length 2 Meter
c. With matching colored snag-less, electrometric polyolefin boot.
d. Terminals with gold plated contacts of 50-micron inch thick gold over nickel.

e.	Patchcord has a characteristic impedance of 100 +/- 3 ohms
f.	Back-ward-compatibility with all current Cat 6 products and Applications.
g.	Guaranteed full duplex Crosstalk values
h.	Improved PS –NEXT,ELEFEXT and Return Loss performances
i.	Category 6 patch cords with four pair twisted cable terminated with RJ45 modular plugs at both the ends.
j.	Patch Cord should have TIA/EIA 568C.2 standards.
k.	Category 6 patch cord should be 100% factory made and performance tested.
l.	Category 6 patch cord length requires – 2 meter as per require in BOM.
Performance Characteristics	
a.	Patch cord conductor should be 24 AWG, multi-strands.
b.	Patch core conductor metal should be made from bare copper.
c.	Insulation material should be high density polyethylene.
d.	Heat resistance of patch cord should be 60° Celsius.
Modular Connector/Plug Characteristics	
a.	Patch cord plug should be gold plated 30U°.
b.	Contact blade of plug should be made from phosphor bronze.
c.	Bidder Must produce the manufacturer Authorization certificate from the OEM with respect to this Project.

32. Supply of Bi-Di SFP module (Pairs)	**Qty- 100 Nos**

Sr. No		**Minimum Specifications**
a.	Features	1-port mini-GIC LX Single-mode Fiber Transceiver (up to 10km, support
		These SFP modules comes in pair.In view of this 100 pairs means 100 Tx and 100 Rx Module.
		Transceiver should be Small Form-Pluggable (SFP) form factor and compatible with quoted switches.
		Transceiver should be Hot pluggable and support 1G speed on Single Mode.
		Should be Multi-Source Agreement (MSA) specification compliant.
		Transceiver should be compliant with IEEE802.3ah 1000BASE-BX-Dand IEEE802.3ah 1000BASE-BX-Ustandards.
		Transceiver distance capacity should be 10Km or more
		Maximum power budget must be atleast 18dB
		Operating wavelength: Receiver SFP TX @ 1310nm and RX @ 1550nm, Transmitter SFP TX @ 1550nm and RX @ 1310nm
		Transceiver interface should be Simplex LC connector.

33. Installation, testing & commissioning of Item No-32	**Qty- 48 Nos**
All modules will be checked and verified at site	
34. Supply, Installation and commissioning of SC-PC to LC Connectors-2 Mtrs.	
SC-SC Fiber Patch Cord, Qty- 200 Nos	
a. 3mm simplex or Duplex Zipcord.	
b. Configurable with standard SCand SC Terminations.	
c. Yellow colour for Single mode	
d. Should Meet and exceeds ITU specifications	
e. Meets and exceeds ITU specifications	
f. Outside Diameter (Simplex)	: 1.6mm x 3.0mm
g. Outside Diameter (Duplex)	: 1.6mm x 3.3mm
h. Minimum Cable Retention Strength	: 1.6mm: 11.24 lbs (50 N)
SC-LC Fiber Optic Patch Cord Qty- 200 Nos	
a. 3mm simplex or Duplex Zipcord.	
b. Configurable with standard SC and LC Terminations.	

c. Yellow color for Single mode and Shall Meet and exceeds ITU specifications	
d. Outside Diameter (Simplex) : 1.6mm x 3.0mm	
e. Outside Diameter (Duplex) : 1.6mm x 3.3mm	
f. Minimum Cable Retention Strength : 1.6mm: 11.24 lbs (50 N)	
g. Anti-rodent coat should be given on every core and cable without outer Sheath	
35. Supply, Installation and commissioning of Surge protecting devices for data lines (LAN)with Metal Body	**Qty-240 Nos**

Electrical specification

Nominal Voltage	30 V
Maximum working voltage Uc RMS/DC)	26 V / 37.8 V
Current rating (signal)	750 mA
In-line resistance (per line ±10%)	1.0 Ω
Bandwidth (-3 dB 50 Ω system)	
Discharge capacity:	10KA in 8/20
Load current	140mA

From 6V to 200V d.c

Transient specification

Let-through voltage (all conductors) Up	
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs	53.0 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs	48.0 V
B2 test 4 kV 10/700 µs	43.5 V
5 kV, 10/700 µs(4)	44.3 V

Maximum surge current

D1 test 10/350 µs to – Per signal wire BS EN/EN/IEC 61643-21: – Per pair-2.5 kA

Mechanical Specification

Connection type	Pluggable 12 way screw terminal - maximum torque 0.6 Nm/PT version:
Conductor size (stranded)	2.5 mm2
Earth connection	Via DIN rail or M5 threaded hole in base of unit
Case material	FR Polymer UL-94 V-0

Should be with the RJ45 sockets they allow a flexible and easy installation.

With weather proof enclosures

Installation of SPD for Data Lines.

Connect in series with the signal or data line either near where it enters or leaves the building or close to the equipment being protected. Install in a cabinet/cubicle close to the system's earth star point.

36. Supply, Installation and commissioning of Surge protecting devices for power	**Qty- 50 Nos**

Ambient conditions

Shock (operation)	25 g

Vibration (operation)	5 g

General

Standards/specifications	IEC 61643-11 2011
	EN 61643-11 2012
IEC test classification	II
	T2
EN type	T2
Number of ports	One
SPD design	Combination type
Mode of protection	L-N
	L-PE
	N-PE
Mounting type	DIN rail: 35 mm
Color	black
Housing material	PA 6.6
	PBT
Pollution degree	2
Inflammability class according to UL 94	V-0
Type	DIN rail module, two-section, divisible
Number of positions	4
Surge protection fault message	Optical, remote indicator contact

Protective circuit

Nominal voltage U_N	240/415 V AC (TN-S)
	240/415 V AC (TT)
Nominal frequency f_N	50 Hz (60 Hz)
Maximum continuous operating voltage U_C (L-L)	335 V AC
Maximum continuous voltage UC (N-PE)	260 V AC
Rated load current I_L	80 A
Residual current I_{PE}	≤ 5 µA
Standby power consumption P_C	≤ 450 mVA
Nominal discharge current I_n (8/20) µs (L-N)	20 kA
Nominal discharge current I_n (8/20) µs (L-PE)	20 kA
Nominal discharge current I_n (8/20) µs (N-PE)	20 kA
Maximum discharge current I_{max} (8/20) µs (L-N)	40 kA

37. Supply of 55" Display Monitors along with wall mount unit,	**Qty -10 Nos**

LED Monitor High Resolution, Low bezel

a. should be more than 55” Diagonal Size
b. Class Measured 54.6" / 138.7cm
c. Resolution 3840x2160(16:9) not less than this
d. It should have Pixel Pitch at least (mm) 0.105 x 0.315 (mm)
e. It should have Active Display Area 1209.60(H) x 680.40(V) not greater than this.
f. Brightness(Typ.) should be min Landscape: 600nit(peak 1,500nit), Portrait: 500nit (peak 1,000nit)
g. Contrast Ratio not less than (Typ.) 6000:1
h. Viewing Angle not less than (H/V) 178/178
i. Response time not greater than (G to G) 6ms (Typ)
j. Display Colors not less than 1.07B (True Display10bit)
k. Color Gamut Color Volume 100% (DCI-P3)
l. Operation Hour 16/7
m. Display Dynamic C/R Mega
n. Scanning Frequency not less than 30 ~ 81kHZ
o. Maximum Pixel Frequency not less than 594MHz
p. Type Built in Speaker should not be less than (10W + 10W)
q. Input Power should be Range-Internal Internal Power Supply AC 100 - 240 V~ (+/- 10 %), 50/60 Hz
r. Minimum following Ports required at least-RGB Display -Port 1.2(1),VIDEO HDMI 2.0 (2),HDCP HDCP2.(2),USB 2.0 x 2,Output Audio HDMI #1,ARC support HDMI #1,EXTERNAL CONTROL,

RS232C(in/out), RJ45RS232C(in/out)

s. Power Consumption not greater than -On mode [W] 122(Typical), 180(Rating), 198(Max)
t. Sleep mode less than 0.5W
u. Mechanical Spec
v. It should have VESA Mount 400x400
w. It should be Stand Type Foot Stand/Wall Mount
x. Bezel Width not greater than (Top/Side/Bot) (1 mm) Bezel-less
y. **Features:**-It should have following Features Key -QLED Signage Display, Slim & Light Signage with Built-in MagicInfo S5, SSSP 5.0
Service Processor should be Cortex A72 1.7GHz Quad-Core CPU
Clock Speed 1.7GHz Quad-Core CPU
Main Memory Interface 3GB / 3ch 64bit LPDDR4 1.6GHz
Storage not less than (FDM) 8GB (3.88GB Occupied by O/S, 4.12GB(Available)
It should have Multimedia Video Decoder - MPEG1/2/4, H.263, H.264/AVC - UHD , JPEG Audio DSP(Decoder) - MPEG, AC3, AC4, DD, MP3 and etc
Certifications Safety 60950-1, EMC Class A ,
RequiredAccessories-Quick Setup Guide, Warranty Card, Power Cord, Remote Controller

38. Installation, testing & commissioning of Item No-37	**Qty- 9 Nos**

Display System shall be installed on the walls of the control room and required casing capping for routing of power cable and HDMI cable is in the scope of supplier. Supply of required length power cable and HDMI cable is also in the scope of supplier.

39. Supply of Pole of 1.5 mtrs high for installing the PTZ cameras including fixing structure	**Qty- 11Nos**

a. Hot Dip 50 micron thick Galvanized hexagonal Camera Poles of 5 meters height with necessary accessories for camera mounting.

b. Thickness : 2 mm or bigger

c. Diameter : 2 inch or higher

d. The material used shall be mild steel/HT steel as per IS 2062:2006

e. All the steel fabrication parts shall be given two coats of approved epoxy painting.

f. The foundation shall be of Reinforced Concrete. Backfilling should of well compacted.

g. Provision shall be made in the pole to route the cable inside the pole. Suitable GI conduit shall be placed inside the concrete foundation to route the cables.

h. The poles shall be designed to experience a maximum wind speed of 180 Km/hr as per IS 875. The safe bearing capacity of the soil is assumed as 10 tons/sq. m

40. Installation, testing & commissioning of Item No-39	**Qty- 11 Nos**

Construction of foundation structure for pole as per site condition and accordance with the EIC. Installation and configuration of items should be done as per the instructions of EIC.

41. Supply of 9U rack for terminations in the field with IP-54 or better compliance	**Qty- 22 Nos**

Sr. No.	**Particulars**	**Specifications**
a.	Characteristics and Dimension	Wall Mount 9U - 500 W x 450 D
		Accessories should be included like 1U Cable Manager 4 Nos., Roof Mounted Fan Unit / 90 CFM / 230V AC, 6 Way 5 Amp Power Distribution Unit, Mounting Hardware Kit etc
		Conforms to DIN 41494 OR equivalent ISO Standards
		Adjustable 19” equipment mounting verticals provide the better mounting flexibility, and maximizes the usable mounting space
		Depth adjustable mounting slots

		Front metalic Door with Lock
		Bottom Panel with ventilation and cable entry facility
		Powder coated finish with Seven Tank pretreatment process meeting all industry standards
		Grounding and Bonding Options. 100% assured compatibility with all equipment's conforming to DIN 41494 (General industrial standards for equipment)
	These 9U racks will be installed in the field either at pole or wall, necessary mounting accessories shall be provided. The rack dimension should be compatible will network switch and other items required to be installed in the field.	

42. Installation, testing & commissioning of Item No-41	**Qty- 22 Nos**
i. RCC foundation as per requirement shall be made as per the weight of the rack and the Base frame of the panel shall be grouted in the foundation.	
ii. Two concealed G. I Sleeves shall be installed in the foundation for incoming and outgoing cables of size 3C x 6 Sq. mm and 24C Fiber optic cables.	
iii. Panel shall be mounted over the base frame of high quality stainless steel.	
iv. Panel, Base Frame and Foundation drawing shall be designed by bidder and get approved from BARC Engineer-in-charge.	
v. 9U wall mount rack is to installed on designated location with appropriate mounting screws.	
vi. All the drilling, hammering, tagging etc. work required must be done by the vendor.	
vii. Cables to be terminated inside rack must be routed neatly inside rack and terminated as per need.	
viii. After installation, openings if any should be plugged such that the racks are vermin free.	

43. Supply of 12U rack for terminations in the field with IP54 or better compliance	**Qty-2 Nos**

Particulars	**Specifications**
Characteristicand Dimension	Wall Mount 12U - 500 W x 450 D.
	Accessories should be included like 1U Cable Manager 4 Nos., Roof Mounted Fan Unit / 90 CFM / 230V AC, 6 Way 5 Amp Power Distribution Unit, Mounting Hardware Kit, etc.
	Conforms to DIN 41494 OR equivalent ISO Standards
	Adjustable 19" equipment mounting verticals provide the better mounting flexibility, and maximizes the usable mounting space
	Depth adjustable mounting slots
	Front metalic Door with lock
	bottom Panel with ventilation and cable entry facility
	Powder coated finish with Seven Tank pretreatment process meeting all industry standards
	Grounding and Bonding Options. 100% assured compatibility with all equipment's conforming to DIN 41494 (General industrial standards for equipment)

44. Installation, testing & commissioning of Item No-43	**Qty- 2 Nos**
i. Installation of 12 U Rack through Anchor Fastener / HILTI bolts on the concrete walls orRCC foundation shall be made as per the weight of the rack and the Base frame of the panel shall be grouted in the foundation.	
ii. Two concealed G. I Sleeves shall be installed in the foundation for incoming and outgoing cables of size 3C x 6 Sq. mm and 24C Fiber optic cables.	
iii. Panel shall be mounted over the base frame of high quality stainless steel.	
iv. Panel, Base Frame and Foundation drawing shall be designed by bidder and get approved from BARC Engineer-in-charge.	

v. 12U wall mount rack is to installed on designated location with appropriate mounting screws.
vi. All the drilling, hammering, tagging etc. work required must be done by the vendor.
vii. Cables to be terminated inside rack must be routed neatly inside rack and terminated as per need.
viii. After installation, openings if any should be plugged such that the racks are vermin free.
ix. Drilling of holes on the panel for routing of cable
x. Glanding of cables by use of metallic cable gland. Supply of glands and other consumables is in the scope of contractor.

45. Supply of 42U x 19" standard rack for network components and CCTV servers and storage, network switch and PDB etc	**Qty- 1Nos**

Inside Dimension : Height = 74" Depth = 44" Width = 19" Overall Dimension : 24" (w) x 47" (d) x 80" (h) Mounting depth (post to post): 38.3"
Guaranteed Compatibility: Fits all IBM, HP, Dell and Sun servers. Good ventilation: Front / Rear door and Roof top is perforated. Additional Temperature Sensor is included. Cable Management: Top Roof features Four 5.5" x 2" cutouts for cable entry. Security / Restricting access: Lockable front door, rear door, side panels and top cover. Safety : Heavy duty framework holds 2200lbs / 1000Kg load rating. Unit Marking at Front and Rear. Rolls through a 7 foot Doorway.
Basic Frame : End Frame + 4 x square cut vertical mounting railings + depth supporters + Mounting support
Front Door : Perforated Door (with Temperature Sensor)
Rear Door : Split Perforated Door
Side Panels : Plain Side Panels
Caster base (Castor base) , Leveling feet and M6 screw pack with 50 x M6 screws + 50 x washers + 50 x cage nuts for mounting are included

46. Installation, testing & commissioning of Item No-45	**Qty- 1 Nos**

a. Installation of floor mounted racks by welding the panel on embedded parts where ever available.
b. Installation of floor mounted racks by Anchor Fastener / HILTI bolts where embedded parts are not available or as advised by Engineer in charge.
c. Installation of LAN components inside rack
d. Drilling of holes on the panel for routing of cable
e. Glanding of cables by use of metallic cable gland. Supply of glands and other consumables is in the scope of contractor.
f. Cable dressing through cable trays/ cable managers provided with the rack.

47. Supply of 6core 9/125-micronSM fiber optic armored cable	**Qty- 8000 mtr**

Sr. No.	**Particulars**	**Specifications**
a.	General Features	

		Fiber cable should be Single Mode. Suitable for Outdoor Local Area Network Systems.
		Should have excellent Water Proof Layer & Good Moisture Resistance.
		Central Loose tube with jelly compound.
		Glass yarns in between Steel tape & loose tube.
		Fiber cable should support standard ITU-T: REC G.652D and Telecordia: GR-6 Core.
b.	Mechanical Characteristics	
		Fiber cable outer diameter should be 6F 6 mm +/- 0.3mm
		Thickness of the Jacket should be 1.8mm +/- 0.2mm
		Should have 3000N/100mm Crush Load (IEC 60794-1-2-E3).
		Bend Radius (IEC 60794-1-2-E11 & E6) should be Short Term 20D in mm and Long Term 10D in mm.
c.	Geometrical Properties	
		Mode field diameter 9.2um ±0.4
		Clad Diameter 125um ±0.7
		Core cladding concentrity error 0.8 µM
		Dynamic tensile strength (unaged) must be 550 Kpsi (3.8 Gpa)
d.	Other Characteristics	
		Maximum Attenuation at 1310nm should be <=0.36 dB/km.
		Maximum Attenuation at 1550nm should be <=0.22 dB/km.
		Maximum PMD at 1310nm and 1550 nm should be <=0.2 ps/sqrt km.
		Fibercutoff wavelength should be 1160nm to 1320nm.
		Cabled Cutoff Wavelength should be <=1260 nm.
		Zero Dispersion wave length 1300 to 1322 nM
		Zero dispersion slope ≤0.092 ps/ nm^2 Km
		Polarisation mode dispersion co efficient ≤ 0.2@1310nM& 1550 nM
		Cut off wavelength ≤1260 nM
		Fibre Macro bend (100 Turns 75 nMdia @1550 nM≤ 0.05 dB) (1 turn 32 mm dia @ 1550 nM ≤ 0.5 dB)
		Coating strip force 1.3 ≤T ≤ 8.9 N
		Minimum Proof Strength 0.70 GPa (100 kpsi)
a. FOC cable shall be laid over the GI Tray. The cable shall be rodent and termite proof.		
b. The type test and routine test of the fiber optic cables must be done in the factory in presence of departmental representatives.		
c. The cable must confirm the DOT / IEC standard mentioned below.		
d. The cable is to be supplied in single piece; Optical fibers must be mechanically strippable.		
e. Each fiber must be distinguishable by means of color coding in accordance with TIA/EIA-598-A, "Optical		

	Fiber Cable Color Coding." and must be marked. Single mode Cable jacket must be a PVC material that is fungus, water and UV resistant. The jacket must be marked with the manufacturer's name, sequential meter or foot marking, month and year of manufacture.	
f.	A cable data sheet must accompany each cable. Cable data must include manufacturer number, billable length, bandwidth specs and measured attenuation of each fiber.	
g.	Supply of Single mode, Steel tape armoredfiber optic Loose tube cable as per specifications given in the technical sheet.	
h.	The Fiber Optic segments should be of continuous lengths without any joints and patches.	
48.	**Supply of Armored shielded cat6e cable (roll of 305 Mtrs)**	**Qty -3050 mtrs**
Sr. No.	**Particulars**	**Specifications**
a.	Features	Category 6 shielded Twisted 4 pair shall be compliant with ANSI/TIA/EIA-568-C.2, ISO/IEC 11801, CENELEC EN50173-1,
		Should support 1000BASE-T (1 Gigabit Ethernet) standard.
		Category 6 should operate on bandwidth up to 250MHz as per standard and tested up to 600MHz.
		Category 6 can run 1000BASE-T at 100 meters.
		Category 6 cable should have UL listed and ETL verified and ERTL Testing and ROHS
b.	Construction Characteristics	1. Construction & Dimensions- Construction 4 Shielded twisted pairs (STP)
		2. Inner Conductor Solid Bare Copper- Conductor Diameter (mm) 0.530 ± 0.010
		3. Insulation Material HDPE- Insulation Thickness (mm) 0.25 ± 0.0 Insulation Diameter (mm) 1.030 ± 0.05
		4. Pairing- White /Blue – Blue White /Orange – Orange White /Green – Green White /Brown- Brown
		5. Laid –up- Laid Up diameter (mm) 4.60 ± 0.5
		6. Shielding - Al-Mylar Tape Thickness , Overlap & Coverage- 0.025mm , 2mm & 100%Continuity Material - Annealing Tinned Copper (26 AWG (0.40 mm)
		7. Rip Chord- Nylon rip chord
		8. Inner Sheath - PVC Sheathing Thickness (mm) -0.50 ± 0.010 Inner Sheath Diameter (mm)- 6.0 ± 0.5 Inner Sheath Colour –Grey
		9. Armouring- Galvanised Steel Wire

c.	Electrical Properties	Nominal mutual capacitance at -1KHZ 56nf/km Maximum Conductor DCR -92.0 Ohm/Km . NVP- Nominal velocity of Propagation- 65% @ 250 MHz SKEW-propagation delay difference- Max 48ns/100 mts @ 250 MHz. Mean Characteristics impedance- 100+/- 15 Ohm @250 MHz.
		Mutual Capacitance: <5.6nF/100Mtrs
		Resistance Unbalance: 5% Max
		Operating voltage: 72V
		Dielectric strength: 1.0KV dc / 0.75KV ac for 1 minute.
d.	Other Characteristics	YEAR" “Manufacturer name" "4 PAIR x 23 AWG" "(STP) CAT 6""ARMOURED" TIA/EIA-568 B. 2-1 CABLE” + Sequential meterMarking
		Need to submit transmission characteristics report per 100 meter. The report at least includes Insertion Loss, RL, NEXT and PSNEXT data.

49. Supply of CCTV Armored Power Cable 2.5 sq. mm	**Qty- 8000 mtrs**

This specification covers the requirement for design, manufacture and supply of XLPE insulated PVC sheathed FRLS cables for medium and High voltage systems and cable joining / terminating accessories for high voltage / low voltage systems for working voltage 1.1 kV.

The cables shall comply with the latest edition of the following standards:

Sr. No	IS code	Description
a.	IS: 7098 (Part I and II)	Cross – linked polyethylene insulated PVC sheathed cables for working voltage
b.	IS: 8130	Conductor for insulated electric cables and flexible cords
c.	IS: 5831	PVC insulation and sheath of electric cables
d.	IS:3975	Steel wires for armoring of cables
e.	IS: 2633	Method of testing weight, thickness and uniformity of coating on hot dipped galvanized articles
f.	IS:209	Specification of zinc
g.	IS:3961 (Part – II)	Recommended current ratings for PVC sheathed heavy duty cables
h.	IS:10418	Wooden drums for electric cables
i.	IEC:502	Extruded solid dielectric insulated power cables for rated voltages from 1 kV to 30 kV
j.	IEC:40 & 540 A	Test method for insulation and sheaths of electric cables and cords.
k.	IS:10462	Fictious calculation method for determination of dimensions of protective coverings of elastomeric and thermoplastic insulated cables
l.	IS:10810 (Part – 58)	Oxygen Index Test

<u>General Construction</u>:

The cables shall be suitable for laying in trays, trenches and for underground buried installation with uncontrolled backfill and possibility of flooding by water and chemicals.

Outer sheath of all XLPE cables shall be black in color. In addition, suitable chemicals shall be added into the PVC compound of the outer sheath to protect the cable against rodent and termite attack. Sequential marking of the length of the cable in meters shall be provided on the outer sheath at every one meter. The embossing shall be legible and indelible. The overall diameter of the cables shall be strictly as per the values declared in the technical information

furnished before taking up the job subject to a maximum tolerance of +2 mm.PVC / Rubber end caps shall be supplied free of cost for each drum. In addition, ends of the cables shall be properly sealed with caps to avoid ingress of water during transportation and storage.

Specification for XLPE cables

The conductor shall be stranded and compacted circular for all cables.

a. All cables shall be rated 1.1 kV.

b. The core insulation shall be with cross – linked polyethylene insulating compound applied by extrusion. It shall be free from voids and shall withstand all mechanical and thermal stress under steady state and transient operating conditions. It shall conform to the properties given intable – I of IS:7098 (Part – II)

c. The XLPE insulation shall be extruded and the core identification shall be by colored strips or by printed numerals.

d. The inner sheath shall be applied over the laid up cores by extrusion and shall conform to the requirements of type ST – 2 compound of IS:5831. The extruded inner sheath shall be of uniform thickness. For multicore cables, the armouring shall be by galvanized round steel wire and in case of single core cables, H grade hard drawn aluminium round wire of 2.5Sq. mm diameter.

e. The outer sheath of the cables shall be applied by extrusion after the armouring and shall be of PVC compound conforming to the requirement of type of IS: 5831. The thickness of outer sheath shall be as per amendment No. 1 to Table 5 of IS: 7098 part 2. (Column 3 & for both armoured and unarmouredcables)

Fire performance of outer sheath shall be as follows:

1. Critical Oxygen index shall be more than 33%
2. Temperature index shall be more than 350^{o}C
3. Smoke density (Light transmission) shall be more than 50%
4. Acid gas generation shall be less than 20%
5. Flammability shall be as per IEC 332-1 and IS 694: 1990
6. Volume resistivity shall be as per IS 1554/694
7. Thickness of insulation shall not be less than 0.8mm

f. The dimensions of the insulation, inner sheath and armour materials shall be governed by values given in Tables 2, 3 and 4 (Method 'b') of IS: 7098 part – II.

g. After completion of manufacture of cables and prior to dispatch the cables shall be subject to special tests as detailed below. BARC reserves the right to witness all tests with sufficient advance notice from vendor. The test reports for all cables shall be got approved from the Engineer before the dispatch of the cables.

h. All routine tests, acceptance tests and type tests shall be carried out on cables as listed in IS: 1554 part – I.

i. The inner and outer sheath of XLPE cables shall be subjected to all the tests applicable for PVC cables. The test requirement for insulation and sheath of PVC cables shall be as per latest revision of IS:5831.

j. Following are the special tests to be performed on the cables and test results shall be submitted to BARC.

i. Accelerated water absorption test for insulation as per NEMA – WC – 7 for XLPE insulated cables

ii. Dielectric Retention Test: The dielectric strength of the cable insulation tested in accordance with NEMA WC – 7 at 75 +1 deg shall not be less than 50% of the original dielectric strength.

iii. Oxygen Index Test: The test shall be carried out as per ASTMD 2863 or applicable Indian Standard specification.

iv. Test for rodent and termite repulsion property.

v. The vendors shall furnish the test details for analyze the property by chemical method.

k. Cable Accessories:

Type test should have been carried out to prove the general qualities and design of given type of termination / jointing system. The type test shall include the following tests conforming to VDE 0278 / IS specification. The type test certificates shall be submitted to the Engineer In – charge.

i. Rated withstand AC voltage test

ii. Partial discharge test

iii. Rated Withstand surge voltage test

iv. Continuous AC voltage test with cyclic current load (Number of heating cycles – 3)

v. Partial discharge test

vi. Continuous AC voltage test with cyclic current load (Number of heating cycles – 60)

vii. Thermal short circuit test

viii. Continuous AC voltage test with cyclic current load

ix. Rated withstand surge voltage test

x. D. C voltage test

xi. Test under the influence of moisture

xii. Dynamic short circuit test

a. Packing and Marking:

Cables shall be dispatched in non – returnable wooden drums of suitable barrel diameter, securely battened with the take – off end fully protected against mechanical damage. The wood used for construction of the drum shall be properly seasoned, sound and free parts used shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit or storage.

On the flange of the drum necessary information such as project title "BARC, NRB, INRP", manufacturer's name, type size, voltage, drum no, cable code, BIS certification direction of rotation of the drum etc shall be provided.

b. Cables shall be supplied in drum lengths as follows:

a. Medium voltage power cables upto and including 6 Sq. mm – 1000 meter.

b. tolerance of plus or minus 5% shall be permissible for each drum. However overall tolerance on each size of cable shall be limited to +2%.

c. **Approved Makes:** KEC International (RPGcables) / Universal Cables / NICCO / TORRENT

50. Supply, Installation &commissioning of 1" corrugated HDPE Pipe | **Qty-1000 mtr**

Sr. No.	Particulars	Specifications
a	Size of pipe	1"
b	Thickness of the pipe	0.5 mm
c	Thread of the pipe	Minimum of 32 mm
d	Thread length	2.0mm
e	Working pressure	6 Kg/ cm^2

General requirement for HDPE pipe:

1. Highly Corrosion Resistance.
2. Pipe must have smooth surface inside as well outside.
3. The solvent cement joints must provide leak proof and the joint is as strong as the parent materials.
4. Type and routine test will be done at the factory in presence of departmental representatives.
5. HDPE Pipe to lay FO Cable on Wall Surface inside the building and outside the building beyond man height.
6. HDPE Pipe must be medium duty.
7. 1.0 inch. Dia. HDPE pipe must be used for Armoured Fiber Optic cable.

51. Splicing of fiber core and terminations | **Qty- 500 nos**

Jointing kit shall be suitable for the below mentioned FOC cable.

a.	Coloredfiber diameter	:245 ± 15 µM
b.	Core diameter	:8.3 or 9.1 µM
c.	Cladding diameter	:125.0±1.0 µM
d.	Cladding non-circularity	:<1.0%
e.	Core cladding concentricity error	:0.8µ
f.	Dynamic tensile strength(unaged)	:550 Kpsi (3.8 Gpa)
g.	Outside cable diameter	:15 mm(24 core)
h.	Dynamic fatigue	:>20
i.	Attenuation	:0.36 dB / KM @ 1310 nM
		:0.23 dB / KM @ 1550 nM
		:0.40 dB / KM @ 1285 – 1330 nM
j.	Attenuation at water peak	:2.0 dB / KM @ 1385 nM
k.	Cable cut-off wave length	:<1260 nM
l.	Zero Dispersion wave length	:1300 to 1322 nM

m. Zero dispersion slope	: ≤0.092 ps/ nm2 Km
n. Polarization mode dispersion coefficient	:≤ 0.2@1310 nM& 1550 nM
o. Cut off wavelength	: ≤1260 nM
p. Fiber Macro bend	:(100 Turns 75nM dia @1550nM≤ 0.05db
	:(1 turn 32 mm dia @ 1550 nM≤ 0.5 dB
q. Coating strip force	:1.3 ≤T ≤ 8.9 N
r. Minimum Proof Strength	:0.70GPa (100 kpsi)
s. Protection	: IP 66
t. Inlet and outlets	: Separate for Incoming 24 core FOC and Outgoing 24 core FOC with proper glanding and closure with tagging to inlet

u. Splicing of fiber is to be done using standard splicer and standard procedure used in industry which causes minimum losses at spliced joint.

v. All fibers shall be spliced and terminated in the optical fiber patch panel as per advise of Engineer in-charge(EIC) at every location and shall be made through up to the nearest Hub location using optical patch cords.

w. OFC, which run in the exposed areas or where directly buried in ground shall be contained in protective conduits and shall be as approved by EIC. Laying of fibers shall conform to the manufacturer's recommendation concerning the mechanical constraints, such as the minimum bending radius.

x. Provide and install machine-printed label strips on the front and for each port of the patch Panels.

y. After laying and splicing of the Fiber cable, testing of cable has to be carried out by OTDR/Power meter. It would be the responsibility of the bidder to get the 20years performance warranty certificate from the OEM manufacturer.

z. The fiber after proper splicing which should not exceed 0.02 db (splice loss) has to be tested for the link loss after proper splice & the link loss should not exceed the specification as per the EIA/TIA Standards and the calculation as specified below:

aa. Acceptable link Attn. = cable attn. + Connection attn. + Splice Attn. + CPR Adj.

Wherein

cable Attn. = Cable length(km) X (3.40 dB/Km@ 850nm or 1.00 dB/Km@1300nm)

Connection Attn. (ST or SC connectors) = (connections X 0.39 dB) + 0.42dB

Splice Attn.(Fusion) = splices X 0.30 dB

CPR Adj. = 0 for single mode cable

bb. Proper care while splicing and cable laying has to be done to attain a loss lesser than the link loss budget. The site has to be certified with proper documentation under the 20 years performance warranty from the manufacturer.

52.	**Supply, Installation and commissioning of JB with terminal block & C channel**	**Qty- 70 Nos**

This WJB shall be positioned on the 600 mm stand, fixed on theconcrete/brick wall or pole as decided by the EIC. The dimensions of the JB shall be 600[H] X800[W] X 600[D].This WJB shall accommodate the following.

a. Industrial grade Switch -1 no.

b. Light Interface Unit - 1 no.

c. Power supply unit - 1 no.

d. Power line surge protection device - 1 no.

e. Data line surge protection device - 1 no.

f. Info-outlets

g. Power sockets - 4 nos.(min)·

h. Terminal blocks for power and signal cables·

i. Cable glands from the bottom for taking the cable fromthe trench to the junction box·

j. Shall have opening from both sides with double door

k. Lights shall be provided inside the junction box.

- DIN rail to accommodate devices shall be provided

53.	**Supply of Step Type-Ladder**	**Qty- 1 No**

a. Type-Step ladder
b. Maximum-Reach Height (Feet)
c. 10.0000-OSHA Compliant,
d. UNSPSC-30191500
e. Safety Listing-CSA safety listing
f. Number of Steps-5
g. Rung/Step Depth (Inches)-4.0000
h. Rung/Step Material-Aluminium
i. Rung Type-D
j. Step Rise (Inches)-12.0000
k. Weight (lbs.)-21.0000
l. Weather Resistant Material- Fiberglass
m. Color/Finish Family- Orange
n. Warranty-1
o. Ladder Rating- Type 1A - 300 lbs.
p. Load Capacity (lbs.)-300.0000
q. Height (Feet)-6.0000
r. Width (Inches)-23.0000

54.	**Supply of Self Supported Cum Extension Ladder**	**Qty- 1 No**

a. Brand Name: Werner
b. Product Type: Extension Ladder
c. ANSI Certified: Yes
d. ANSI Ladder Rating: Type II
e. Base Spread: 17.3 in.
f. Brand Name: Werner
g. CSA Listed: No
h. Capacity: 225 lb
i. Material: Aluminium
j. Maximum Ladder Height: 20 ft.
k. Minimum Ladder Height: 10 ft.
l. Non Conductive: No
m. Nonslip Tread: Yes
n. Number of Steps: 20
o. OSHA Compliant: Yes
p. Rung or Step Depth: 1.75 in.
q. Twin Steps: Yes
r. Weather Resistant: Yes

s.	Width: 17.33 in.	
t.	Rung or Step Materials: Aluminium	
55. Supply of Battery Operated Vehicle for Maintenance of the CCTV system		**Qty- 1 No**
Parameter		**Range**
Certification Parameters:		
a.	Vehicle Certification	ICAT
b.	Vehicle Certification Number and Date	CAOB0066 30/03/2019
c.	If Vehicle Certification from Others Agency, Name of the Agency otherwise put NA	ICAT
Generic Parameters:		
a) Type of E Cart		Fully Electric, Battery Operated Motor Driven for Carrying Goods
b) Model Number of E- Cart		E-RATH CARGO
c) Colour of E cart		Red
d) The E Cart Must Fabricated from Good Quality Steel properly Painted to avoid Rusting for more than 5 Years,		Yes
e) Name and Grade of Steel from which E Cart Body Framed		CRC
f) Kerb Weight of E- Cart (kg)		365 kilograms
g) Goods Carrying Capacity (kg)		310 kilograms
h) Run Distance (for a Full Charge of Battery, to be tested with full load at maximum AIS-040 (km)		100
i) Type of Chassis for E cart		MS
j) Ground Clearance as per IS: 9435		180
k) Wheel Base (mm)		2140 mm
l) Turning Radius (mm)		2400 mm
m) Power Transmission from Motor Shaft to Wheels		Direct Mounting
n) Please Specify the Mechanical Mechanism otherwise Put NA		NA
o) Type of Battery as per AIS-048		Lithium ion
p) Capacity of the Battery approved by ICAT/ARAI (Ah)		100
q) Battery Voltage, Nominal		48V
r) Maximum Overall Dimensions of the Battery (L x W x H) (mm3)		410*172*275
s) Nominal Filled Weight of the Battery (kg)		96 kilograms
t) Motor Controller (Must Suitable for starting, accelerating, decelerating, driving, and stopping of E Cart		SUITABLE
u) Battery Charger		220/230 V Nominal Input Voltage, High Efficiency Type
v) Charging Current (A)		40
w) Type of Motor		Brushless DC Motor
x) Motor Output Power ,48V/60V at Full Load (watt)		1700
y) Overall Efficiency of the E Cart to be tested at Full Load with maximum speed as per Concerned AIS standards (%)		90
z) Gradeability of E-cart to be tested at full procedure as per AIS -003 Load (Degree)		30
aa) Thickness of Material of Sheet used for Roof of E-Cart (mm)		4
bb) Material of the roof of E-Cart, if Enclosed Otherwise Put NA		Fibre Glass of Good Quality
Constructional Parameters:		
a) Seating Facility Front		For Driver only
b) Length of E -cart as per Gazette Notification by Ministry of Road and Transport Oct, 2014		2.8

(metres)	
c) Width of E -Cart as per Gazette Notification by Ministry of Road and Transport Oct, 2014 (meters)	1
d) Height of E -Cart as per Gazette Notification by Ministry of Road and Transport Oct, 2014 (meters)	1.77
e) Dimensions of the cabin Provided for Transport of Goods (mm x mm x mm) (mm3)	1350*950*762
f) Size of Front Tyre (mm)	300-12
g) Size of Rear Tyre (mm)	300-12
h) Brake Type (Front)	drum
i) Brake Type (Rear)	DRUM
j) Suspension System (Rear)	hydraulic
k) Suspension System (Front)	Leafspring
l) Reverse Gear Facility	Yes
m) The Mounting of Batteries	Yes
n) Vehicle lighting System	LED Based
o) Instrument Panel Containing Speedometer and Battery Charging Indicator	Yes
p) Glass Windshield with wiper motor as approved by ICAT/ARAI	Yes
q) Battery Make as per AIS: 048:2009	Exide
r) If others please specify the material Otherwise put NA	NA
s) Equipped with Start and Stop Button, parking Lights, Back lights with Reverse Gear Facility	Yes
t) Equipped with Fire Extinguisher	Yes
u) Equipped with First Aid Box	Yes
v) Yellow Colour reflective tape on Front and Rear Side of the E Cart	Yes
w) E Cart Integration,	Yes
x) Type of Cabin used for Transportation of Goods	Open
y) If others please specify the Name of Brand, otherwise put NA (as per AIS :048:2009)	NA

Performance Parameters:	
a) Speed of the E-Cart as per CMVR -2014 with latest amendment (to be tested with Full Load) (km/h)	25
b) Battery Warranty in years (Years)	3 year
c) No. Of Free Service	1
d) Compliance of Centre of Gravity of E Cart as a Compulsory Norms for Safety	Yes
e) Confirming to Applicable Environmental Test	Yes
f) Noise level must be Low during Operation	Yes

56. Supply, Installation and commissioning of PVC Conduit flexible 25mm		**Qty- 500 Mtrs**
Sr. No.	**Particulars**	**Specifications**
1.	Material	PVC
2.	Size	25mm dia
3.	Color	Black
4.	Durable and impact resistant	Yes
5.	Fire retardant	Yes
6.	Accessories	Includes all required accessories

Installation, testing & commissioning of 25mm Flexible conduit.

a. Flexible conduits are to installed at locations were cable is to bent and casing capping is not possible.

b. The ends of conduit must be packed appropriately so as there is no open visible cable ends (Vermin free).	
57. Supply, Installation and commissioning of PDB's	**Qty- 2 No**
a. Numbers of poles Single Pole	
b. Characteristic C	
c. Breaking Capacity 10 kA	
d. Rated Voltage 230V AC	
e. Current limitation class 3 as per EN 60898, IEC 60898	
f. Frequency 50 Hz	
g. Minimum operating voltage 230V AC	
h. Enclosure Polyester, self-extinguishing, heat and fire resistant	
i. according to IEC 60898-1, glow-wire test at 960 °C	
j. for external parts made of insulating material necessary to retain in position current-carrying	
k. parts and parts of protective circuit (650°C for all other external parts made of insulating material	
l. Mounting Position Vertical / Horizontal / Upside down / On the side	
m. Fixing Snap fixing on standard IN rail profile- 35 x 75 Surface mounting with two screws	
n. Maximum cable sizes Top /Bottom for rigid cable 1 to 35 mm²	
o. Top /Bottom for flexible standard cable 1 to 35mm²	
p. Applied connection 2.5 Nm	

58. Supply, Installation and commissioning of MCB's	**Qty- 50 No**
Specifications-UL 489, C 22.2 No. 5, IEC 60947-2 Number of poles-2 Trip curves-C, K Rated current- 6 Amp Internal resistance per poleRi- 56 milli Ohms Power loss – Py- 2 W Rated voltage- 277/Y480 VAC up to 35 A (K trip curve) Short circuit interrupt rating-10 kA Mounting position-any Protection degree-IP 20 Mounting-35 mm DIN rail Terminal screw tighteningTorque-25 in. lbs (2.8 Nm) Cable size-AWG 4-16 Service life, mechanical- 25 g - 2 shocks - 13 ms	
59. Supply of Network switch-12 port, POE+ managed Layer 2 with four SFP ports	**Qty- 4 Nos.**
Standards -IEEE 802.1d, IEEE 802.1p, IEEE 802.1Q, IEEE 802.1s, IEEE 802.1w, IEEE 802.1X, IEEE 802.1ab, IEEE 802.1ax, IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z, IEEE 802.3ab, IEEE 802.3ad, IEEE 802.3az, IEEE 802.3af, IEEE 802.3at	
Device Interface8 x Gigabit PoE+ ports, 4 x Gigabit SFP slots, 1 x Console port (RJ-45), 1 x USB Port (firmware update, logs, configuration), 6-pin removable terminal block (primary/RPS power inputs & alarm relay output), DIP switches, LED indicators, Reboot button	
Data Transfer Rate-Ethernet: 10Mbps (half-duplex), 20Mbps (full-duplex), Fast Ethernet: 100Mbps (half duplex), 200Mbps (full duplex), Gigabit Ethernet: 2000Mbps (full duplex), SFP: 2000Mbps (full duplex),	
Performance Switch fabric: 24Gbps, RAM buffer: 512MB, MAC address table: 16K entries, Jumbo frames: 10KB, Forwarding mode: store and forward, Forwarding rate: 17.9Mpps (64-byte packet size)	
Management HTTP web-based GUI, CLI: Telnet / SSHv2, SNMP v1, v2c, v3,SNMP trap (up to 5 receivers) RMON groups 1/2/3/9, Device configuration backup & restore, upgrade firmware, reboot, and reset to default, Multiple administrative or read-only user accounts, Enable or disable power saving mode per port, Static MAC	

entries, LLDP (Link layer discovery protocol), Netlite device map, ONVIF device discovery, SNTP, SMTP alert, Syslog, Port statistics/utilization, Traffic monitor, Port mirror: one to one, many to one, Storm control: Broadcast, multicast, destination lookup failure (Min. limit: 1pps), Loopback detection, DHCP relay/option 82, Xpress Ring, ERPS (Ethernet Ring Protection Switching) G8032v2,SFP DDMI (Digital Diagnostic Monitoring Interface)
MIB MIB II RFC 1213, Bridge MIB RFC 1493, RMON (Group 1,2,3,9) RFC 2819 RFC 1757
Spanning Tree IEEE 802.1d STP (spanning tree protocol), IEEE 802.1w RSTP (rapid spanning tree protocol), IEEE 802.1s MSTP (multiple spanning tree protocol), BPDU filter, guard, and root guard
Link Aggregation Static link aggregation and 802.3ad dynamic LACP (Up to 3 groups)
Quality of Service (QoS) 802.1p Class of service (CoS), DSCP (Differentiated Services Code Point), Bandwidth control per port, Queue Scheduling: strict priority (SP), weighted round robin (WRR), weighted fair queuing (WFQ)
VLAN 802.1Q tagged VLAN, MAC-based VLAN, Port isolation, Up to 256 VLAN groups, ID range 1-4094
Multicast
IGMP snooping v1, v2, v3, IGMP querier, IGMP fast leave, Up to 256 multicast groups, Static multicast entries
Access Control
802.1X authentication (Local user database, RADIUS, guest VLAN assignment), DHCP snooping/screening, Trusted host/IP access list for management access, Port Security/MAC address learning restriction (Up to 100 entries per port), Static/dynamic ARP inspection
ACL
Source/Destination MAC address, Source/Destination IP address, Source Interface, VLAN ID
EtherType, TCP/UDP port 1-65535
Layer 3 Features
IPv4 / IPv6 static routing, IPv4 / IPv6 proxy ARP, IP interfaces: Up to 16, Routing table entries: Up to 500 (IPv4: 400 / IPv6: 100), DHCP Relay / Option 82
Special Features
Netlite device discovery and map display in GUI, Port security: MAC address learning restriction per port, DHCP relay/option 82 & DHCP server snooping/screening support, Wide operating temperature range, Dual redundant power inputs, Alarm relay triggered by power failure, Surge and ESD protection
Power
PWR (Primary) terminal input: 48 – 57V DC, RPS (Redundant) terminal input: 48 – 57V DC, Compatible power supply: TI-S48048 (480W) sold separately, Max. Consumption: 15W (no PoE load); 258W (full PoE load)
PoE
PoE budget: 240W@48V DC input, 802.3at: Up to 30W per port, PoE Mode A: Pins 1, 2, 3, and 6 for power, PoE auto classification, PoE port priority/power scheduling/PD alive check, Over current/short circuit protection
Terminal Block

Redundant power inputs, alarm relay contact, 6 pin, Wire range: 0.5 mm^2 to 2.5 mm^2, Solid wire (AWG): 12-26, Stranded wire (AWG): 12-26, Wire strip length: 10-11mm		
DIP Switch		
Switch	Status	Function
1	OFF	Disable alarm relay for PWR power input
ON	Enable alarm relay for power failure on PWR power input	
2	OFF	Disable alarm relay for RPS power input
ON	Enable alarm relay for power failure on RPS power input	
Alarm Relay Output		
Relay output with current carrying capacity of 1A, 24V DC		
Short circuit mode when one power source is connected		
Open circuit mode when two power sources are connected		
Enclosure		
IP30 rated metal enclosure, Fanless passive cooling, DIN-Rail mount, Grounding point, ESD (Ethernet) Protection: 8KV DC, Surge (Power) Protection: 6KV DC		
Warranty - 3 year		
60. Supply of IP based Horn Speakers		**Qty- 30 Nos**
a. Power Consumption- DC 24V, less than equal to 50W		
b. Network Protocol:- TCP,UDP,ARP,ICMP		
c. Audio Coding:- MP2,MP3,PCM		
d. Audio Sampling:- 8Khz-48kHz, 16 bit, 8Kbps-320Kbps		
e. S/N:- Grater Than equal to 90 db, 190Hz to 18 kHz		
f. Audio Delay:- Broadcast delay less than equal to 30 ms		
g. Power out:- 40 Watt		
h. Language:- English		
It should have following features		
a) With an integration of the network audio decoding and digital amplifier and speakers and a installation of wall-mounted design.		
b) With a HISLICON CHIP with 10 Second start time , Device shall come in working mode after 1Min		
c) With a built-in Horn speakers and Mono power amplifiers of Class-D		
d) With a built-in loop detector to remotely monitor the working conditions of the speaker; easy to maintenance		
e) To remotely adjust the volume of the output volume on the server		
f) With a waterproof ratio of IPX5 design, completely suitable for outdoor environment.		
g) With a standard RJ45 interface Support		
61. Installation and commissioning of IP based Horn Speakers		**Qty- 24 Nos**
a) Mount horn-type speakers approximately 8 to 10 feet (2.5 to 3 meters) above the floor and fasten to a suitable support structure.		
b) Do not position speakers so that they are facing each other unless they are more than 50 feet apart.		
c) Orient the speaker so that a person standing in the center of the coverage area can sight directly along its axis of projection. Adjust the orientation of horn-type speakers installed with speaker mounting assemblies vertically and horizontally after the entire assembly is permanently mounted and wired.		
d) Adjust the vertical orientation using the two locking nuts on the U-bracket of thespeaker.		
e) Adjust the horizontal orientation using the locknut on the pipe nipple assembly supporting the mounting		

bracket adapter.

62. Supply, installation and commissioning of SIP Mike	**Qty- 2 Nos**

a. Power Consumption- 12-24V DC, or PoE (Power Over Ethernet) , 12 watt

b. Network Protocol:-TCP,UDP,ARP,ICMP

c. Network Chip Rate:- 10/100 Mbps

d. Audio Sampling:-8Khz

e. S/N:- Grater Than equal to 90 db

f. Frequency Response:-300hz to 8khz

g. Network Delay:- Intercom Transition delay less than equal to 30 ms

h. Display Screen:-2.4 inch LCD display

i. Language:- English(YES)

j. Interface:-1 RJ45 In

<u>Technical Specification for Street Light polefixtures and associated works</u>

63. Supply of 6mtr high Hot Dip Galvanized HR Steel Sheet (3 mm thick) Octagonal street light pole having bottom of 130 mm A/F, top 70 mm A/F including provision for mounting of camera at 5 mtrs and double arm bracket for fixing of two nos of 40W LED fixtures at a height of 6 mtrs with Foundation Bolt Sets (Each set contains 4 numbers of foundation bolts) and Double Arm Bracket of arm length 1mtr	**Qty- 60 Nos**

The scope includes design, manufacture, testing, packing, Supply, fixing and installation of hot dip galvanized octagonal uniform tapered flanged type poles to be fixed on the foundation bolts with base plate arrangement.

Sr.No.	**Specification**	**Limit**
a.	Height of the pole from Basement	6.0 M above ground level
b	Thickness of the pole	3 mm
c	Bottom diameter	130 mm (Across Face)
d	Top diameter	70 mm (Across Face)
e	Base plate dimension	200 mm x 200 mm x 16 mm
f	No. of section	One
g	Cross section of pole	Octagonal
h	Yield strength	Minimum 350 N/ SQMM

Hot dip galvanized octagonal poles shall be supplied with foundation bolts (4 nos with 3 nos of nuts and 1 no. of plain washer in eachbolt), single arm bracket for mounting the LED light fixture and 16 sqmm stud type connector (4 nos) inside the pole at door opening for cable connection.

A. The Octagonal Poles and bracket shall comply with the requirement as per latest Indianstandard.

B. Each pole shall have a concealed junction box for termination. The looping box shall be provided with a suitable busbar arrangement to loop 2 to 3 cables of size16sq.mm and MCB/5A fuse cutout.

C. The pole shall be provided with necessary cross arm for mounting street light fitting. Both undergroundcable and GI earth wire shall be terminated atthe terminal/ looping box in the looping zone. Furtherwiring to the light fixture shallbe done with three core flexible copper wire (2core for power supply and third core for earthing).

D. Each street light pole shall be provided with double coil earthing, using 8 swg GI wire wound to form 50mm diameter earth electrode and shall be connectedtoearthing stud of the pole. Theearth electrode shall be buried

up to a depth of 1.0mbelow ground level.

1. Design:

i. The octagonal poles shall be designed as per standard BS EN 40-3-1&3.

ii. The Octagonal Poles shall be designed to withstand the maximum wind speed as per IS 875 Part III: 1987.

iii. The top loading i.e. area and the weight of fixtures are tobe considered to calculate maximum deflection of the pole and the sameshall meet the requirement of BS: 5649 Part VI 1982.

2. Pole Shaft:

i. The pole should be of octagonal shape made of single sheet with welded by folding the sheet in octagonal shape. There shall not be any circumferential welding. The welding of pole shaft shall be done by Submerged Arc Welding (SAW) process.

ii. The galvanised poles shall be in a single piece of required length.

iii. All octagonal pole shafts shall be provided with the rigid flange plate ofsuitable thickness with provision for fixing 4 foundation bolts. This baseplate shall be fillet welded to the pole shaft at two locations i.e. from insideand outside. The welding shall be done as per qualified MMAW process approved by BARC or Third Party Inspection agency approved by BARC.

iv. There shall be in-built facility to mount single pole MCB (2A) and Bakelite sheet with stud type copper terminal connectors suitable for termination of 2 runs of 4Cx16Sqmm and 1 run of 3Cx1.5Sqmm cable for fitting.

v. Poles shall be pre-drilled and supplied complete with pole top cap and base plate.

vi. The bottom of the pole should be welded as per standard for holding the pole in vertical position.

vii. The pole should be treated properly to avoid the corrosion and painted if necessary.

viii. The termination box should be concealed for termination.

ix. The pole should be pre-wired with 1.5 Sq.mm, 3 cores, copper conductor flexible PVC insulated cable for the lighting fixture. This cable should be routed inside the hot dip pole.

x. This cable should not be exposed outside atmosphere. If it is to be exposed proper protection should be provided.

xi. The pole should be fabricated to mount Double arm with LED fixture of 40W.

xii. The hot dip galvanized brackets should be supplied along with hot dip pole to mount the LED lighting fixture of rating 70W.

xiii. The hot dip galvanized pole should be fitted on the basement and the pole should be easily removable type.

xiv. Each pole should have their own MCB with proper rating for safety of the lighting fixture.

3. **Door Opening**:

i. The octagonal Poles shall have door of approximate 500 mm length at theelevation of 500 mm from the Base plate. The door shall be vandal resistanceand shall be weather proof to ensure safety of inside connections. The doorshall be flushed with the exterior surface and shall have suitable lockingarrangement. There shall also be suitable arrangement for the purpose ofearthing. The pole shall be adequately strengthened at the location of thedoor to compensate for the loss in section.

4. Material:

i. Octagonal Poles: material used for octagonal pole shaft shall confirm to BS EN 10025/ IS 2062 with yield strength of 350 N/SQMM.

ii. Base Plate, flange plates: AS PER IS 226 / IS 2062

iii. Hot Dip Galvanized as per IS 2629 or BS EN ISO 1461.

iv. Foundation Bolts: EN.8 grade

5. **Welding:**

The welding shall be carried out confirming to approved procedures duly qualified by BARC QA or third party inspection agency approved by BARC.The welders shall also be qualified for welding the octagonal shafts.All welds shall ensure no fissures inside or outsides surfaces, and no Blowholes.

6. **Pole Sections:**

The Octagonal Poles shall be in single section. There shall notbe any circumferential weld joint. The pole drawing should be got approved from engineer in- charge before fabrication

7. **Galvanization:**

The poles shall be hot dip galvanized as per IS 2629 or BS EN ISO 1461 standard. The galvanizingshall be done in single dipping.The galvanizing coating shall be smooth, continuous and uniform. It shall be free from acid spots and shall not scale or blister nor be removable while handling or packing.

8. **Fixing Type:**

Fixing of poles shall be on foundation bolts with base plate arrangement. The GI Octagonal pole shall be suitable for mounting on concrete foundation.

The Octagonal Poles shall be bolted on a foundation with a set of four foundation bolts for greater rigidity.

9. **Top Mountings:**

The galvanized mounting bracket shall be supplied along with the Octagonal

Poles for installation of the luminaries.

10. The one meter length single arm bracket shall be hot dip galvanized internally and externally as per IS 2629/ BS EN ISO 1461 standards with average coating thickness as per relevant IS standard. The galvanizing shall be done in single dipping.
11. Installation of poles shall be done as per design and drawing. Foundation drawing shall be submitted for Engineer-In-charge's approval.
12. Theother consumable required to complete the job in all respects is in contractor's scope.
13. **Installation of street light fixtures:**

    This includes fixing of street light fitting complete with accessories and lamps at the end ofthe pole/bracket, connecting it with designed capacity and size copper conductor, PVCinsulated cable from termination box of pole, testing and commissioning.The third core shall be connected to earth point of pole.

14. The successful vendor shall submit test certificate from NABL approved laboratory. The laboratory test must confirm the thickness of coating given for the particular batch of material supplied. The batch no. and year of manufacture shall be marked on the name plate of the supplied material.
15. Erection and commissioning of hot dip galvanized octagonal pole of 6 meters heightmade out of 3 mm thick sheet having bottom 130 mm A / F and top 70 mm A / F and base plate 220 X 220 X 16 mm with single arm Bracket. The pole shall be installed in cementconcrete foundation 1:2:4 (1 cement, 2 crushed sand and 4 graded stone aggregate of nominal size 20mm) with the help ofanchor bolts of suitable size. Each poleshould be double earthed with 8 SWG GI wires. Junction Boxes shall also be Earthed using suitable GI Rope. OR as per Manufacturer's Recommendation.
16. The civil foundation of pole shall be as per drawing. While casting of the foundation, two nos of 40mm dia, 1500mm length of GI pipes to be provided for cable entry &cable exit.
17. Testing and Commissioning of Junction boxes for each pole including wiring, cabling connecting etc. The terminalbox should be concealed within pole at 500mmabove base plate along with a suitable earth terminal. The terminationof incoming/outgoing cable size 4CX16 Sq. mm copper shall be used for loop-in/loop-out wire between street poles. The appropriate size lugs of proper qualitysuitable for 4CX 25 Sq.mm copper shall

be used to terminate cable onterminal. Wiring between terminals, MCB and the light fittings shall be with 3 core copper wire of 1.5 sq mm.

18. Packing and Dispatch:

All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship/rail or trailer. The equipment shall be wrapped with in polythene sheets before being placed in crates/ cases to prevent damage. Crates/ cases shall haveskid bottom for handling. Special notations such as weight, owner's particulars, PO nos etc. shall be clearly marked on the package.

64. Installation and commissioning of item no. 63	**Qty- 60 Nos**
65. Supply of Suitable size FRP termination box. Each FRP box Shall have 10A MCB for each fixture and 4 nos. of FRP base connector for the cable termination for 25 Sq.mm Cu cable	**Qty- 60 Nos**
66. Installation and commissioning of Item no-65	**Qty- 60 Nos**
67. Supply of outdoor type, free standing, floor mounted, double door with locking arrangement Feeder pillar suitable for 415 V, 3 phase, 4 wire, 50Hz, fabricated out of Pregalvanized G. I sheet steel duly compartmentalized, powder coated, dust and vermin proof (IP-54)with one no. 125 A incomer MCCB , bus bar as required, Astronomical analog time switch: 1 No., Voltmeter with selector switch, Ammeter with selector switch, CT, Indication lamps, protective fuses, danger notice plate etc as required, 2 outgoing loops from feeder pillar. Each outgoing loop has 1 No. of 63 A TPN SFU, 1 No. of 63A TPN MCCB, 1 No. of 63 A TPN ELCB and 1 No. of 63 A TPN power contactor. Feeder pillar should be supplied with its base frame	**Qty- 2 Nos**

1. **SCOPE:**

The specification covers the requirement of design, manufacture, assembly, inspection and testing at works and supply of Feeder Pillar complete with all accessories and other miscellaneous equipments specified in this specification.

The materials supply including loading at factory, transportation, unloading at work site and erection at specified location including civil and structural foundation work, inspection, testing & commissioning up tosatisfactory operation. Further touching up of damaged powder coated painting shall be carried out at site after installation of all panels is completed by the contractor. The system shall be A.C. 3 phase, 4 wire, 415V, 50Hz with effectively grounded neutral. Feeder details of the Feeder pillar is as follows:

1	No. of incoming feeder:	2 nos. of 125A SFU
2	No. of outgoing feeder:	4 nos. of 63A SFU
3	No. of astronomical analog time switch:	1 no.
4	No. of contactor for auto operation in each outgoing feeder.	1 no. of 63A
5	No. of MCCB in each outgoing feeder	1 no. of 63A
6	No. of ELCB in each outgoing feeder	1 no. of 63A

2. **STANDARDS:**

The following Codes and Standards shall be applicable for continuous performance of all electrical equipment to be supplied, delivered at site, tested and commissioned. The electrical equipment offered shall comply the relevant Indian Standard Specifications and in particular to Indian Electricity Rules in all respects with all its latest amendments up to date.

If the specifications other than those mentioned below are applicable, the fact should be made clear in the bid and one copy of such standard specifications in the English language shall be enclosed withthe bid.

Sr.No.	Standard	Standard Description
1	IS:116	Circuit Breakers for AC systems
2	IS:6875/ 1973	Control switches, push buttons and related Part I & II control switches.
3	IS:3072	Code of Practice for Installation of Switch gear.
4	IS:13947/ 1993 (Part 1 & 2)	Specification for Low-voltage Switchgear and Control gear.
5	IS:2633/ 1972	Specification for hot-dip galvanization .
6	IS: 3043	Code of practice for earthing.
7	IS:159	Bus bars and bus bar connections.
8	IS:3106	Code of practice for selection, installation and maintenance of Fuse (Upto 650 V)
9	IS:8623	Switchgear and Control gear assemblies
10	IS 2705	Current Transformer
11	IS 1248	Indicating Instruments
12	IS 722	Integrating Instruments
13	IS 2959	AC Contactors

3. **PRINCIPAL PARAMETERS:**

The Feeder Pillar Box shall conform to the specific Technical requirement specified hereunder.

i. Rated Voltage: 3 phase, 415V
ii. Supply variation: 415V±10%
iii. Rated Frequency: 50Hz
iv. Type: outdoor
v. Mounting: on concrete foundation
vi. Suitable for 3 ph 4 wire with earthed neutral

4. **Feeder Pillar Box Description:**

1) Feeder Pillar Box shall be suitable for the purpose for which they are intended to be used.Each box shall be complete with following accessories:
   i. The feeder pillar box shall be complete with incomer switch fuse unit, MCCB, timer for switching on/ off, outgoing SFU, MCCB and contactor.
   ii. Suitable capacity of Ammeter, Voltmeter, Selector switch, Phase indicators
   iii. Lock & Key

The feeder pillar-Box shall comprise of the following accessories.

(A) Feeder Pillar box Metal Body with weather proof metal paint powder coated after chemical treatment.

(B) Protection to the UG cable service mains by disconnecting the power supply in case ofservice main cable faults and excess drawl of power by the consumers than the sanctionedpower.

2) Feeder Pillar Box shall have access for sufficient ventilation and head description.

3) The equipment shall be designed for operation in high ambient temperature and high humidity tropical atmospheric conditions. Means shall be provided to facilitate ease of inspection, cleaning and repairs in the installations where continuity of operation is of prime importance.
4) The design shall ensure that weight of the components is adequately supported without deformation or loss of alignment during transit or during operation.
5) The cable entry and exit shall be from bottom of the panel. The design of the panel/box must besuch as to facilitate easy removal of the cable during erection and repair by suitable bolting thebox cover and sliding the bottom gland plates. The panel shall be provided with suitable glandand clamps for fixing the cable rigidly. The feeder pillar box shall be suitable for 1.1kV 3½ core 50 Sq.mm armored UG cable throughG.I./ PVC pipe. The clearance inside the boxmust be such as to offer fair working facilities during erection and maintenance and shall be in accordance with relevant IS code.
6) The feeder pillar shall have front and rear compartments. Front compartment shall be suitable for switchgear and the rear for cable terminations. Asbestos sheet of at least 6mm thick shall be provided for separation between front and rear compartments.
7) Perforated G.I sheets of suitable gauge shall be provided inside the main bus bar chamber and vertical bus bar section. After opening of the bus bar chamber cover, these perforated sheets should be visible, as this is to be provided for ventilation purpose and to avoid direct access to main bus after the opening of the bus bar alley. The size of the holes shall be of suitable diameter. This sheets shall be painted with RAL 7033.
8) The inside surface of the box shall be insulated by fiber sheet to with stand 1.1 kV insulation to prevent flash over.
9) The box shall have doors from front and back side. The complete box shall be rigid self-supporting and free standing.
10) The box shall be outdoor type, anti-corrosive, rust proof, vermin and water proof, dust proof, ultra violet stabilized and flame retardant with IP-65 protection.
11) Louvers of suitable size shall be provided on both sides of the pillar for ventilation and stainless steel wire nets shall be provided on the back of the louvers to prevent the entry of dust and insect. Mounting of components inside the enclosure shall allow free air circulation keeping the clearances as per relevant standard code.
12) The box shall have double door (self-closing type) fitted with internal type door lock withcommon key for all the boxes and shall give maximum protection to the interior of the box.
13) Doors and compartment partitions shall be fabricated using 16 guage thick pre galvanized G. I Sheet steel. Sheet steel shrouds and partitions shall be of minimum 16 guage thickness. All sheet steel work forming the exterior of switchboards shall be smoothly finished, leveled and free from flaws. The corners should be rounded. All the sheet steel forming the exterior of the switch board should be fabricated using 14 gauge Pre – galvanized G. I Sheets.
14) All sheets shall be pre galvanized G.I sheet steel approved by EIC, BARC. If it is found at any stage that CRCA or Black sheets have been used, the panel shall be summarily rejected.
15) The base and doors of feeder pillar box shall be individually in one piece for fixing of the accessories like hinges, clamps, mounting clamps, bolts etc.
16) On closing of doors, right door shall rest on the left door. Hinges shall be of such construction that the doors shall be swung open by not less than 150^0.
17) The doors shall be centrally closed with “Godrej” type triple position locking arrangementand shall be operational with a common handle from outside the door. Movement of handle will lock the doors at center, top & bottom. A Nylon washer shall be provided between the handle and door to avoid penetration of water. One central lock with brass levers shall be provided inside the door. Key way with suitable cover shall be provided on the door for operating the lock from outside. Two keys shall be supplied for each pillar. Cleat arrangement shall also be provided for putting two nos. of padlocks suitable for size of doors.
18) The Feeder Pillar Box shall be suitable to mount on brick concrete foundation. Necessaryprovision for foundation bolt in the pillar shall be made for GI foundation bolts of suitable size, Nuts, Bolts and 2 Nos. of washers.
19) The box shall be provided with suitable rain shed and all bolt and washers used shall begalvanized mild steel.
20) The top of the canopy of outer enclosure should be of single sheet folded to avoid water entry with IP54.
21) Enameled Danger Board shall be displayed on the left hand side of front and back doors of the box.
22) All nuts and bolts in electrical circuit shall be of non-magnetic stainless steel.
23) Suitable no. of detachable gland plates shall be provided in the cubicle at the bottom. Gland plate shall be provided with suitablesize cable gland & with four screws for fixing the plate from inside.
24) Two galvanized earthing Bolts of M12 X 50 mm sizeshall be welded from inside andprojecting outside of the box. Two Nuts with washers shall be provided on each bolt.
25) Stand for mounting shall be made of G.I angle of suitable size.
26) The feeder pillar box shall be installed on a raised concrete foundation block.
27) Lifting hooks shall be provided in all four corners of the feeder pillar.

28) Front and rear doors should be fitted with dust excluding synthetic rubber gaskets with fasteners designed to ensure proper compression of gaskets. When covers are provided in place of doors, generous overlap shall be assured between sheet steel surfaces with closely spaced fasteners to preclude the entry of dust.
29) Clearances shall be maintained during normal service conditions. Creepage distances shall comply to those specified in relevant standards.
30) All insulating material used in the construction of the equipment shall be of non-hygroscopic material, duly treated to withstand the effects of high humidity, high temperature tropical ambient service conditions.
31) Metallic/ insulated barriers shall be provided within vertical sections and between adjacent sections to ensure prevention of accidental contact with main busbars and vertical risers during operation, inspection or maintenance of functional units and front mounted accessories.
32) All doors/ covers providing access to live power equipments circuits shall be provided with tool operated fasteners to prevent unauthorized access.
33) Metallic Finish: Two coats of granule finished powder coating of Siemens gray having shade no. RAL 7033 is to be done from inside and outside of the panel on all exterior and interior side, by wet on wet process, with an interval of 2-3 minutes between coats. One coat involves 2 phases horizontally/ vertically over the entire surface on all exterior and interior side. All the panels shall be granule finished powder coated painted with Siemens gray having shade no. RAL 7033 from outside and inside and dried up in oven.
34) Metallic/ insulated barriers shall be provided within vertical sections and between adjacent sections to ensure prevention of accidents. The bus bars shall be air insulated and made of high conductivity, high strength 99.9% purity tinned copper. The bus bars shall have 99.9% purity. These bus bars shall confirm to I.S specification no. 5082 of 1969 or the latest amendments. For all the moulded case circuit breakers more than 63 amps the connections should be done using tinned copper bus bars. The connections to MCCBs having rating 63 amps and below can be done using HFFR copper flexible wire given in the approved makes. To arrive at the bus bar size, the calculations will be based on 1000 Amps Per Sq. inch. The size of the bus bar thus arrived at shall be chosen to the nearest mm. The sizes of the bus bars shall be chosen in such a manner that the sizes of the terminals and the sizes of the bus bars are matched with each other.
35) The bus bars shall be suitably braced with non hygroscopic SMC supports. The neutral as well as the earth bar should also be able of withstanding the stresses of electrical fault. Ridges shall be provided on the SMC supports to prevent tracking between adjacent bus bars.
36) Large clearances and creepage distances shall be provided on the bus bars system to minimize the possibility of fault.
37) High tensile bolts and spring washers shall be provided at all bus bar joints.
38) The cross section of the bus bars and risers for various rating shall have been decided on the basis of temperature rise test results carried out on some other panels for the stated sections.
39) Connections from the main bus bars to functional circuits shall be arranged and supported so as to withstand without any damage or deformation the thermal and dynamic stresses due to short circuit currents.
40) BUS BARS:
Feeder pillar box shall be provided with colour coded heat shrink sleeves throughout the full length to with stand 1.1 kV. Intermittent colour bands are not acceptable. The earth bus bar shall be provided with green colour heat shrink sleeve. The size of the earth bus bars shall be same as the size of the neutral bus bar but in any case it should not be less than 50x6 mm tinned copper strip with heat shrinkable PVC sleeve. Bus Bars shall be colour coded for easy identification of individual phases and neutral.

Necessary holes may be drilled on the bus bar for mounting the bus bar.

41) Apparatus forming part of the Feeder pillar shall have the following recommended minimum clearances for uninsulated busbars or should be as per relevant IS codes.
    i. Between phases – 25mm
    ii. Between Phases and Neutral – 25mm
    iii. Between Phases and Earth – 25mm
    iv. Between Neutral and Earth – 25mm

5. **EARTHING**:

i. The FP box shall be provided with two Nos. of earthing points internally connected with accessible position on the sides.Theearthing point shall be provided by 25mm M8 galvanized bolts and nuts and marked with S symbol.
ii. All FP box shall be earthed by running 25x3 mm GI flat from the nearest at least one earth pit.
iii. An earthing bus shall be provided and earthed throughout the length of the switch board. It shall be bolted/ brazed to the framework of each unit and each breaker earthing contact bar.
iv. The earth bus shall have sufficient cross section to carry the momentary short circuit and short

time fault current without exceeding maximum allowable temperature rise.

v. The feeder panel shall be connected to earth bus bar throughout the length.

vi. All non-current carrying metallic parts of the mounted equipment shall be earthed.

vii. All Hinged doors and movable parts shall be earthed through flexible copper connections to the fixed frame to the switchboard.

viii. The colour code of earthing wires shall be as per applicable standard. Earthing wire shall be connected on terminals with suitable clamp connection. Soldering shall not be permitted. Looping of earth connection to other devices shall not be permitted. However, looping of earth connection between equipment to promote alternative paths to earth bus shall be provided.

6. **SWITCH FUSE UNIT:**

i. Switch fuse units, incorporated in switchboards wherever required shall conform in all respects to IS 13947: 1993. Switch fuse units shall be suitable for 415 Volts 3 Phase 50 HZ AC supply.

ii. Unit housing shall be of robust construction designed to withstand ardous conditions. Sheet steel used shall be given rigorous rust proofing treatment before fabrication and painting. Units shall have double break per phase in order to isolate fuse links when the switch is in OFF position.

iii. Operating mechanism of units shall be crisp and positive in action with quick- make and quick-break silver plated contacts. Operating handle shall be suitable for rotary operation unless otherwise specified. Position of handle such as ON and OFF shall be clearly indicated.

iv. All live parts inside the switch fuse units shall be shrouded to prevent any accidental contact.

v. All the terminals shall be liberally designed. All units above 100 A shall be provided with integral cable sockets.

vi. Routine and type tests as per IS 13947: 1993 shall be conducted at works and test certificates furnished.

7. **MOULDED CASE CIRCUIT BREAKERS:**

i. Moulded case circuit breakers (MCCB) shall conform to IEC 60947-2 and IS 13947: 1993 in all respects. MCCBs shall be suitable 3 Phase 415 Volts AC 50 HZ supply.

ii. MCCB cover and case shall be made of high strength heat resisting and flame retardant thermosetting insulating material. Operating handle shall be quick make/break, trip - free type. Operating handle shall have suitable ON, OFF and TRIPPED indicators. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases. 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 causes three poles to open simultaneously. All the MCCB's shall be provided with over current, short circuit and earth fault variable releases. All the MCCB should be designed in such a way that no live part is accessible.

iii. Contact trips shall be made of suitable arc resistant sintered alloy. Terminals shall be of liberal design with adequate clearances.

iv. MCCBs shall be provided with following interlocking devices

- Handle interlock to prevent unnecessary manipulations of the breaker.
- Door interlock to prevent door being opened when the breaker is in ON position
- Deinterlocking device to open the door even if the breaker is in ON position.

8. METERING, INSTRUMENTATION AND PROTECTION:

The switchboard shall have required current and potential transformers for metering and protection. The transformers shall comply to relevant IS standard and class of accuracy required for metering and protection. Separate sets of CTs shall be provided for metering and protection.

8.1. Current Transformers:

i. The current transformer shall be FR Grade ABS casing Box type Bar Primary Metering and Protection class CTs. The current transformer shall confirm to IS 2705 (part -I, II and III), IEC 60044-1, BS 3938-1973, BS 7626-1993, BS 7729-1994 and IEC 185-1987 in all respects. All C/Ts used for medium voltage application shall be rated for 1 kV.C/Ts shall have rated primary current, rated burden as specified in schedule of quantities/drawings. Rated secondary current shall be 5A. Class for measurement shall be class 1. C/Ts shall be capable of withstanding magnetic and thermal stresses due to short circuit faults of 31 MVA on medium voltage. Terminals of C/Ts shall be paired permanently for easy identification of poles. C/Ts shall be provided with earthing terminals for earthing chassis, frame work and fixed part of metal casing (if any). Each C/T shall be provided with rating plate indicating:

a) Name and make
b) Serial number
c) Transformation ratio
d) Rated burden
e) Rated voltage
f) Accuracy class

ii. CTs shall be mounted such that they are easily accessible for inspection, maintenance and replacement. Wiring for CT shall be with copper conductor PVC insulated wires with proper termination works and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

iii. **Material:**

The FR grade ABS casing should be ultrasonically welded casings and should be tamper proof with sealing arrangements for terminals. The CTs should be suitable for DIN Rail Mounting, Panels mounting clamps arrangement, busbar holding clamps and any other application so desired by the design. The P1, P2, S1 and S2 markings on the CTs should be embossed and not with a sticker. The FR Grade ABS casing should be minimum 1.5 mm thick.

iv. **The accuracy class:**

All CTs for metering class shall have an accuracy class as 1 for measurement of energy consumption and class 1 for current and other parameter measurements. In case the combined metering is made applicable with various parameters then class 0.5 will be strictly applicable. The errors in the CTs shall be within limits specified in the standards for that particular accuracy class. The metering CTs has to be accurate from 5% to 120% of the rated primary current, at25% and 100% of the rated burden at the specified power factor.

In the case of protection class CTs, the CTs should pass both the ratio and phase errors at the specified accuracy class, usually 5P or 10P, as well as composite error at the accuracy limit factor of the CT.

8.2. Measuring Instruments:

Direct reading electrical instruments shall conform to IS 1248 or in all respects. Accuracy of direct reading shall be 1.0 of voltmeter and 1.5 for ammeters. Other instruments shall have accuracy of 1.5. Meters shall be suitable for continuous operation between -10° C and $+500^{\circ}C$. Meters shall be flush mounting and shall be enclosed in dust tight housing. The housing shall be of steel or phenolic mould. Design and manufacture of meters shall ensure prevention of fogging of instrument glass. Pointer shall be black in colour and shall have Zero position adjustment device operable from outside. Direction of deflection shall be from left to right.

The instruments shall have non-reflecting bezels, clearly divided and indelibly marked scales. Suitable selector switches shall be provided for ammeters and volt meters used in three phase system. The rating type and quantity of meters, instruments and protective device shall be as per Schedule of Quantities /drawings.

8.2.1.Ammeters:

Ammeters shall be of moving iron type. Moving part assembly shall be with jewel bearings. Jewel bearings shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks. Ammeters shall be manufactured and calibrated as per IS 1248

Ammeters shall normally be suitable for 5 A secondary of current transformers.

Ammeters shall be capable of carrying substantial over loads during fault conditions.

8.2.2.Voltmeters:

Voltmeters shall be moving iron type range of 3 phase 415V voltmeters shall be 0-500V. Volt meters shall be provided with protection fuse.

9. Push Buttons:

Push buttons shall be of the momentary contact, push to actuate type, fitted with self-reset contacts and provided with integral escutcheon plates marked with its function.

11. WIRING:

- Cable entries and terminals shall be provided in the switchboard to suit the number, type and size of copper conductor power cables.
- Provision shall be made for bottom entry of cables as required. Generous size of cabling chambers shall be provided, with the position of cable gland and terminals such that cables can be easily and safely terminated.
- Barriers or shrouds shall be provided to permit safe working at theterminals of one circuit without accidentally touching that of another livecircuit.
- Cable risers shall be adequately supported to withstand the effects of ratedshort circuit currents without damage and without causing secondaryfaults.
- Control Wiring:

a) All control wiring shall be carried out with color coded 1100 V gradesingle core HFFR wires conforming to IS 694 / IS 813 having strandedcopper conductors of minimum 2.5 Sq.mm section for potential circuitsand 2.5 Sq. mm for current transformer circuits.

b) Wiring shall be neatly bunched, adequately supported and properlyrouted to allow for easy access and maintenance.
c) Wiring shall be identified by numbered ferrules at each end.Theferrules shall be of the ring type and of non – deteriorating material.They shall be firmly located on each wire so as to prevent freemovement.
d) All control circuits like Fuses shall be mounted in front of the panel andshall be easily accessible.

1. The incomer MCCB should be 125 Amps, 4P suitable for 415V, 50 Hz Supply. A flexible copper cable of suitable size as per EIC shall be brought to the incomer MCCB from a terminal block or connector suitable for termination of Incoming copper cables of size as per drawing. The flexible cables shall be terminated neatly with insulated lugs of appropriate size.
2. The wiring from Incomer MCB shall be brought to a copper bus bar of appropriate size embedded in a CT. The wiring to be used shall be copper flexible cableof suitable size as per EIC.
3. The feeder pillar shall have 63A TPN SFU, 63A TPN MCCB, 63A TPN ELCB and 63A TP contactor in each outgoing feeder. The wiring from outgoing MCCBs should be brought, using a copper flexible cable, to the terminal blocks or connectors suitable for termination of outgoing copper armored cable as per drawing. The flexible cables shall be terminated neatly with insulated lugs of appropriate size.
4. The wiring for the control circuit shall be carried out using 2.5 sq.mm flexible copper cable.

12. **Terminal blocks**

Terminal blocks shall be of suitable voltage grade and type.Insulating barriers shall be provided between adjacent terminals.

13. **Labels**

Labelsshallbe properly secured with fasteners. The material of label shall be anodizedaluminium,withwhiteengravingonblackbackground. Main name plate shall be “Feeder Pillar-1” for one and “Feeder Pillar-2” for the other. Caution labels should be provided at suitable locations.

14. **TEST & TEST CERTIFICATES AND INSPECTION:**

i. The panel along with MCCB’s and connections should have been type tested at CPRI/ Independent test house for short circuit and temperature rise.
ii. The following routine tests shall be carried out on the panels at the factory:
   a) Inspection of feeder panel shall include inspection of wiring.
   b) Checking of overall dimension, thickness of box sheet and paint film.
   c) Bill of materials.
   d) Checking of protective measures and electrical continuity of the protective circuits.
   e) High voltage test for checking insulation and insulation tests before and after the installation.
   f) Heat Run test.
   g) Primary and Secondary injection test for checking of all meters and relays.
   h) Calculation pertaining to sizing of the busbars for air insulated bus bars also calculation of sizing of the bus bars of the main panel.
   i) Insulation resistance of the complete circuit by circuit with all equipments mounted on the panel using insulation Tester/Megger.
   j) Verification of degree of protection as per IS: 13947 (part-I).
   k) Functional Tests:
      - Powder coating test
      - Busbar copper purity test.
iii. Panel shall be subjected to stage inspection at manufacturer’s works.
iv. Inspection may be carried out at various stages of manufacture and also after the completion of manufacture.
v. The vendor shall submit QAP after receipt of work order. During fabrication, switchgear may be subjected to tests by vendor as per EIC, BARC, Tarapur directive and same shall be witnessed by the inspector. Manufacturer shall furnish all necessary information concerning the supply to such inspectors. Stage inspection shall be carried out as follows by BARC, if specially mentioned in tender document:
   a. After fabrication and before powder coating
   b. After powder coating
   c. Final inspection
   d. After power and control wiring.
vi. During final inspection, all routine and acceptance tests shall be carried out at manufacture’s works under his care and expense. Inspection shall not relieve vendor of his responsibility of guarantee and other contractual responsibilities. The vendor shall intimate the readiness of panels for inspection to owner also and owner at their discretion may depute personnel to carryout inspection. Equipment shall be dispatched only after the issuing of release note by BARC.
vii. The 4 pole & TPN M.C.C.Bs to be mounted with Distribution Boxes shallhave been fully type tested as per relevant standard at CPRI/ Govt. Approved laboratory/NABLaccredited

laboratory. The bid shall be accompanying with type-test reports conducted atCentral Power Research Institute / Govt. Approved laboratory for the offered materials conductedwithin five years before the date of opening of the tender. Copies of type test reports inrespect of impulse and short circuit tests must be enclosed with the tender, failing which the Bidis liable for rejection. Department reserves the right to demand repetition of the tests without any extra cost.

viii. Bids not accompanied with type test reports conducted within five years shall not be considered for evaluation.

ix. All routine and acceptance tests as specified by the applicable standard code shall be conducted on the switchboard as a whole. Routine and acceptance test may also be conducted on major components, at respective manufactures works. In lieu, test certificates from respective manufacturers shall be submitted during inspection and may also be acceptable.

x. Type test certificates for the switchgear panel and CB from a recognized testing organization shall be furnished. The vendor shall also submit a list of guaranteed technical particulars with the bids, as per the data sheet of the tender document.

xi. Type tests, if asked in the data sheet shall be performed. Short circuit test shall be performed at CPRI and heat run test may be performed at manufacture's works.

xii. In addition, acceptance test as detailed below shall be conducted to check mechanical and electrical operation and panel wiring to the specification and approved schematic drawings These test shall be provisionally conducted at manufacture's works by providing temporary connection to switchgear units in order to simulate the actual conditions. Tests shall be finally performed at site, in presence of the manufacturer's specialist, once the external cable connections have been completed.

xiii. Acceptance tests but not limited to the following shall be conducted by BARC, final QAP shall be approved by BARC and the testing and witness will be guided as per the approved QAP.

   a. A general visual check, dimension measurement and bill of material check.
   b. Manual and electrical operation of CB, relays, circuit functioning shall be checked under the worst conditions of auxiliary supply voltage.
   c. Dry insulation test with power frequency voltage for the main and auxiliary circuits.
   d. Insulation resistance of the main and auxiliary circuits shall be checked before and after High Voltage withstand test.
   e. Operation check shall be carried out for every control functions as per the approved schematic diagrams by manually simulating fault conditions and operation of control switches/relays etc.
   f. Relays shall be tested with secondary injection test equipment.
   g. For equipment bought from other sub-suppliers certified test reports of test carried out at the manufacturers works shall be submitted. Normally, all routine tests as specified in the relevant standards shall be conducted by the sub-supplier at his works.
   h. Heat run test.

xiv. The feeder pillar box shall be subjected to type test and acceptable test according to the standard to which it conform.

A number of routine and type tests have to be conducted on CTs before they can meet the standards specified above. The test can be classified as:

a) Accuracy tests to be determined whether the errors of the CT are within specified limits.
b) Dielectric insulation tests such as power frequency withstand voltage test on primary and secondary windings for one minute, interturn insulation test at power frequency voltage, impulse test with 1.2u/ 50 wave and partial discharge tests (for voltage>=0.433KV) to determine whether the discharge is below the specified limits
c) Temperature rise test
d) Short time current test
e) Verification of terminal marking and polarity

The manufacturer should conduct routine tests on each CT and all designs are required to be type tested and the results furnished.

All acceptance and routine tests as stipulated in the relevant standards shall be carried out by the manufacturer in presence of department'srepresentative.Equipment shall be dispatched only after the issuing of release note by BARC.

Copies of the type and routine test certificates for all the components used in the manufacture of the box from a recognized test house (to prove the conformity of the components to the relevantstandards) shall be submitted along with the tender. All the type tests shall be carried out at CPRI/ Govt. Approved laboratory/NABL accredited laboratory

15. **INSPECTION:**

i. The inspection may be carried out by the Department at any stage of manufacture. Thesuccessful

Bidder shall grant free access to the Department's representative at a reasonabletime when the work is in progress. Inspection and acceptance of any equipment under this specification by the Department shall not relieve the supplier or his obligation offurnishing equipment in accordance with the specification and shall not prevent subsequentrejection if the equipment is found to be defective.

ii. The supplier shall keep the Department informed in advance about the manufacturingprogramme so that arrangement can be made for inspection.

iii. The Department reserves the right to insist for witnessing the acceptance/routine testing of thebought out items.

iv. Immediately after finalization of the programme of type/acceptance/routine testing, thesupplier shall give fifteen days advance intimation to the Department to enable him to deputehis representative for witnessing the tests.

16. **Name plate:**

i. A nameplate with the panel description shall be fixed at the top of the panel. A separate nameplate giving details for each component of bus section shall be provided.

ii. Name plate (or) polyester adhesive stickers shall be provided for each equipment (lamps, pushbutton, switches, relays, auxiliary contactors etc.) mounted on the panel. Special warning plates shall be provided on removable cover (or) doors giving access to cable terminals and bus bars. Special warning labels shall be provided inside the panel also, wherever considered necessary identification tags shall be provided inside the panels.

iii. Engraved nameplates shall preferably be of 3-ply (Black-White-Black) laminated sheets (or) anodisedaluminium. Hard paper nameplates shall not be acceptable. Nameplates shall be fastened by screws and not by adhesive.

17. **Painting**

All steel works used in the construction of the panel should have undergone a vigorous metal treatment process and then powder coated with RAL 7033 shade paint of minimum thickness of 70 microns.

68. Installation and commissioning of Item no-67	**Qty- 2 Nos**

1. **INSTALLATION:**

The FP panel shall be installed in suitable position with concrete foundation fixing by 4 nos. bolts near to the underground cable trench.

The FP panel shall be made with suitable arrangement for termination of incoming & outgoing underground cables and no. of panels to be inter-connected through underground cable in agroup in looping system.

All type of termination & connection of cable, testing & commissioning to be covered in the contract.

All FP panels shall be connected with proper earthing. At least one earth pits to be installed for one FP panel & connected with 25x3 mm GI flat at two distinct point.

2. The Bidders can quote with their own design with appropriate size suitablyaccommodating the components as indicated in this bid in conforming to the approvedclearances and technical requirements.The drawing and dimension should be submitted with thebidding document.
3. The distribution cabinet should be preferably of IP-65 protective category, with provisionfor lighting inside the cabinet and furnishing a non-detachable Nameplate, which should exhibit the details of LT DistributionCabinet.

1. **TECHNICAL INFORMATION TO BE PROVIDED UNDER THE CONTRACT:**

i. Successful bidder shall be required to provide the following Drawings and Documents, as specified below
   a. Final dimensions/ weights
   b. All drawings for approval
   c. Typical component arrangement drawing
   d. Busbar sizing calculations
   e. All drawings as built 4 prints + 1 soft copy (CD)
   f. Operation and Maintenance Instruction Manual 4 copies

ii. Successful bidder shall furnish all necessary drawings, documents and manuals and all information, as detailed below
   a. Necessary engineering drawings like single line diagram, general arrangement, door GA layout, control, schematic diagrams, terminal connection drawings, panel cross-section drawings, etc.
   b. Detailed drawings showing foundation requirement with load details
   c. Busbar sizing calculation

d. Inspection and Test Certificate for Equipment
e. Type test certificates

iii. Catalogue numbers of all components liable to be replaced during the life of the switchgear.

iv. The panel shall be designed for 415V, 3 Phase, 4 wire, 50 Hz. supply. The panel shall be self-standing cubicle type made of pre – fabricated G. I sheet steel. The panel shall be designed for outdoor duty application. The panel shall be unit type construction, compact and neat. The panel shall be completely front accessible type. Complete panel including busbar chambers, feeder units etc. shall all have enclosure protection of class IP 65. The cubicles shall have front doors provided with concealed hinges, lock and duplicate keys. The panel shall be fixed type as per the SLD. Moulded Case Circuit Breaker (MCCB) will be rated for the breaking capacity as per EIC. All gaskets shall be of 'U' type neoprene rubber. Best quality door locking knobs of unbreakable nature, shall be employed to give continuous trouble free performance. All nuts, bolts, screws and washersused shall be of non-corrosive metal (Zinc plated and chrome treated) fortrouble free maintenance work. All doors shall employ concealed non-corrosive hinges and locking knobs. A removable type gland plate with loose cable glands in sufficient number shall be provided for the panel. All the MCCBs shall be mounted such that their front faces come flush with the structure channels/ angles. All the incoming and outgoing feeders will be provided with cable entry chamber and suitable double compression brass cable glands.

v. The control and auxiliary supply voltage shall be 230V, single phase, 50 Hz AC. All switchgear components selected shall strictly conform to requirements of IS 13947 and shall be type tested as per IS 13947. Type test certificate for Temperature rise and degree of protection (IP-65) shall be furnished along with the offer. The panel shall have **form 4A type of construction**. Design and GA of panel shall be identical to one for which type test certificates have been submitted.

vi. A ground bus of adequate size shall be provided all along the length of the panel. Necessary bolting terminals for connecting them to the ground grid shall be provided.

vii. The power wiring to unit modules shall be done using copper busbars of adequate cross section from the main busbars. Horizontal and vertical busbars will be designed for minimum short circuit capacity of 25 kA for 1 sec. The panel shall be suitable for cable entry from bottom face as specified in SLD.

viii. Space heaters of adequate ratings suitable for operating on 240V, single phase, 50Hz supply shall be provided to prevent moisture condensation inside the panel. The necessary thermostat, a suitable SPN MCB at the point of tapping and manually operated switch for the control of the space heater shall be provided. A 18W CFL fixture with switch and a 5A plug socket with switch shall be provided in each panel.

ix. Spring charging motor shall be provided in incoming and all the outgoing breakers. In the entire outgoing MCCBs, earth fault protection features shall be provided. Spare terminal block shall be provided at all breaker terminals.

x. Thickness of powder coating shall not be less than 70 microns.

xi. The following acceptance tests shall be performed on the panel. Test on complete assembly
a. Physical verification of bill of materials.
b. Inspection of dimensions and visual inspection.
c. Inspection of painting and thickness thereof. It should not be less than 70 microns.
d. Mechanical and electrical operations of components and devices.
e. Insulation resistance measurement of power and control circuits. The IR value should be more than 2 Mohm.
f. High voltage test.
g. Continuity and polarity tests on all coils and circuits.
h. Functional tests on relays.
i. Verification of interlocks as per specifications.
j. Temperature rise test.
k. Milli-volt drop test.
l. Overcurrent and earth fault protection shall be checked by injecting the secondary current in the relay and necessary test reports shall be submitted.

2. **DOCUMENTATION:**

The successful bidder shall submit all the following drawings and documents for approval before commencement of supply:

Busbar sizing calculation for the phase, Neutral and Earth bus with fault level of the panel shall be submitted.

i. As-built drawings (5 Nos. of copies) shall be submitted along with all test certificates,
ii. calibration certificate of the instruments used for measurements, reports, manuals.
iii. Test certificate for HFFR wires used for control wiring and power wiring shall be provided.
iv. Test certificate for all bought components like MCCB shall be sent before inspection for review.
v. Manual for all relays, Breaker (MCCB etc.) shall be submitted before final inspection.
vi. Auxiliary contact block detail for MCCB shall be submitted.
vii. Test Certificate for power supply module-24 V DC shall be submitted.
viii. General outline and assembly drawing of the feeder pillar.

ix. Cross sectional view.
x. Arrangement of terminals & details of connection studs provided.
xi. Name Plate.
xii. Test reports, literature of the bought out items and raw materials.
xiii. Testing facilities available at the works.

3. **COMPLETENESS OF EQUIPMENTS:**

Any fittings accessories or apparatus which may not have been specifically mentioned in this specification but which are usually necessary in equipment of similar plant shall be deemed to be included in the specification and shall be supplied by Bidder without extra charge. All plant and equipment shall be complete in all details whether such details are mentioned in the specification or not.

4. **DISPATCH:**

i. The material to be supplied shall be packed and dispatched only after inspection and approval.Supplier shall be responsible for packing, transporting and delivery to the consignee.

69. LED street light fitting of 40w having System Efficacy of 115 lm/W, system output of 4700 lumens, THD <10%, Power Factor >0.95, CRI >70, CCT 5700K, Full IP 66 protected single piece die cast aluminium housing having PC with Impact resistance IK08, Life L70B50 @ 50k hrs. LED driver should be Potted &Encapsulated . BIS compliant driver should sustain 440V Stress Voltage protection for 8 Hrs., High Cut off : 325V(+/- 15V) and should have feature of Auto Restart, EMC -EMI compliant. Driver shall have 4KV Surge protection and feasibility of 10KV external SPD housed in Luminaire.Similar to Philips Cat no:BRP056 LED47 CW SLF PSU S1	**Qty-120 Nos**

1. **Scope:**

The scope of work includessupply, installation, testing, commissioning of 40 watts, IP66 rated LED street light fixture (Philips "**BRP056 LED47 CW SLF PSU S1**" or equivalent of mentioned approved makes)andit also includes performance criteria for energy efficientLED luminaire complete with all accessories, LED lamps with suitable current control driver circuit including mounting arrangement for outdoor applications.

2. Following Indian Standards must be followed.

SL.NO.	STANDARD NUMBER	NAME OF STANDARD
1.	IS 16101	General Lighting- LEDS and LED modules terms and definitions
2.	IS 16103 part (I & II)	LED modules for general lighting safety and performance requirements
3.	Is 16104	DC or AC supplied electronic control gear for LED modules performance requirements
4.	IS 16105/ LM79	Method of measurement of lumen maintenance of solid state light (LED) sources
5.	IS 16106/ LM80	Method of electrical and photometric measurements of lumen maintenance of solid state light (LED) products
6.	IS 16107 part(I & II)	Luminaries performance
7.	IS 16108	Photo-biological safety of lamps and lamp systems
8.	IS 10322	Specification for luminaire
9.	ANSI/NEMA/ANSLG C78.377-2008	Specifications for the Chromaticity of Solid State Lighting Products

3. General requirements:

3.1 **Luminaries':**

The luminaire shall be designed and tested for general lighting application as per relevant standards.

3.1.1 **Housing of the luminaire:**

The housing construction of luminaire shall meet safety requirements as per IS 10322.The luminaire housing shall have following minimum features:

i. Extruded aluminium heat sink, designed to act as efficient heat dissipater important for LED luminaire.
ii. Pressure die cast aluminium cover on both sides for holding of extruded aluminium heat sink.
iii. Luminaire provided with polycarbonate.
iv. Control gear compartment is an integral part of luminaire. There shall be separate compartment for control gear and LED modules.
v. LEDs are provided with secondary lens optics to get optimum optical performance.
vi. The driver used is specially designed to have sure voltage, open/short circuit protections.
vii. Luminaire is provided with a mounting bracket fixed on pressure die-cast aluminium covers for aiming adjustment.
viii. The luminaire housing shall have minimum IP 66, IK 08 and shall be preferably made up of pressure die cast aluminium LM6 alloy.

3.1.2 **Lumen maintenance and failure fraction:**

The luminaire shall be designed for L70 of 50000hrs. (min) and failure fraction of 10% (max).

3.1.3 **Thermal management of LED luminaire:**

Luminaire shall be designed for proper thermal management of LEDs. LED die temperature is affected by PCB thermal resistance and LED spacing on the board. Designed luminaire shall be such that the LED die temperature does not exceed the maximum Junction Temperature (Tj). Drive current should be determined for the surrounding ambient temperature (Ta) to dissipate the heat from the product.

3.1.4 **Optics**

The luminaire optics shall be designed such that the lumen output shall be uniform and glare free.

3.1.5 **LED driver:**

The LED driver shall be designed for operating voltage range specified below and shall have built in voltage surge protection, short Circuit, & Over Voltage protections.

4 **Technical requirements of Luminaire:**

4.1 **Electrical requirements:**

SL. NO	PARAMETER	RANGE
1.	Range of Operating Voltage	150-270 V AC
2.	Initial input power	40W
3.	Rated Frequency	50 Hz
4.	Total Harmonic Distortion	< 10%
5.	High Voltage Protection	HV cut off @325VAC+/- 15VAC
6.	Short Circuit Protection	Yes
7.	Open Load Protection	Yes
8.	Reverse Polarity Protection	Yes
9.	Driver Isolation	Yes
10.	Power Factor	>0.95

11.	Input Surge Protection	>4 KV
12.	Type of Driver	Constant Current

4.2 **Optical requirements:**

SL. NO	PARAMETER	VALUES
1.	Luminaire Efficacy	120 lumen/watts
2.	System Lumen output	8350 lm CW
3.	Correlated Current Temperature (CCT)	5700K
4.	Colour Rendering Index (CRI)	70
5.	LED Chip	Shall be LM 80 Certified
6.	LED Chip Efficacy	>150 lumen/watts
7.	Diffuser	Shall be UV resistant

4.3 **Environmental requirements:**

SL. NO	PARAMETER	VALUES
1.	Working Temp. Range	$0^{O}C$ to $35^{O}C$
2.	Working Humidity Range	Outdoor application

4.4 **Mechanical requirements:**

SL. NO	PARAMETER	VALUES
1.	Frame/Housing	Pressure die-cast Aluminum housing/ MS CRCA sheet with powder coated with name of company embossed
2.	Heat Sink	Highly efficient extruded aluminum heat sink
3.	Lens	Secondary Lens optics to match with exact beam angle
4.	Front Cover	polycarbonate
5.	IP Grade	IP66
6.	Impact resistance	IK08

5. **Photobiological safety requirements:**

For photo biological safety requirements, the luminaries shall comply with IS 16108.

6. **Testing:**

The luminaire shall be tested at NABL accredited labs as per IS16103 part-2. **Type test certificates** shall be submitted for the following:

SL. NO	TESTS
1.	Marking
2.	Luminaire Power
3.	Luminous Flux
4.	Lighting Intensity
5.	Angular Beam Distribution
6.	Luminaire Intensity Distribution
7.	Chromaticity Coordinates And Correlated Colour Temperature
8.	Colour Rendering Index
9.	Lumen Maintenance
10	Life
11.	Endurance Test
12.	Luminaire Efficacy

The following **acceptance tests** shall be conducted on luminaire:

SL. NO	TESTS
1.	Marking
2.	Luminaire Power
3.	Luminous Flux
4.	Lighting Intensity
5.	Angular Beam Distribution
6.	Luminaire Intensity Distribution
7.	Chromaticity coordinates and correlated Colour Temperature
8.	Colour Rendering Index
9.	Luminaire Efficacy

In the acceptance tests, where the value after the 2000 hours of the operating life is required, only the initial value should be tested after due stabilization of the lamp during the inspection.

The Sampling for acceptance test shall be as done as per IS 10322 (Part 5).

7. **Marking:**

The Luminaire shall be marked with product information as per IS 16107.

8. **Approved Make:**

i. **LED:** CREE/ Osram/ Nichia/ Bridgelux

ii. **Fixture:** Philips/ Osram/ GE/ Havells

69.a. Installation and commissioning of Item no-69, **Qty- 2 Nos**

70. Supply of Power cable of different sizes

I. Power cable (2XWY (P)) of size 4C x 25 Sq.mm, Annealed copper conductor, Multistranded, round wire Armoured, XLPE insulated, cores laid up with HR PVC type inner sheath and outer sheath ZHLS of extruded PVC type ST2(P) and ST2(Y), of 1.1 kV grade as per IS 7098 (part - 1) 1988	**Qty- 500 Mtrs**
II. Power cable (2XWY (P)) of size 3.5C x 50 Sq.mm, Annealed copper conductor, Multistranded, round wire Armoured, XLPE insulated, cores laid up with HR PVC type inner sheath and outer sheath ZHLS of extruded PVC type ST2(P) and ST2(Y), of 1.1 kV grade as per IS 7098 (part - 1) 1988.	**Qty- 300 Mtrs**
III. 3C x 1.5 Sq.mm Unarmored Copper Flexible cable This specification covers the requirement for design, manufacture and supply of XLPE insulated PVC sheathed FRLS cables for medium and High voltage systems and cable joining / terminating accessories for high voltage / low voltage systems. for working voltage 1.1 kV	**Qty- 200 Mtrs**

The cables shall comply with the latest edition of the following standards:

Sr. No	IS code	Description
1.	IS: 7098 (Part I and II)	Cross – linked polyethylene insulated PVC sheathed cables for working voltage
2.	IS: 8130	Conductor for insulated electric cables and flexible cords
3.	IS: 5831	PVC insulation and sheath of electric cables
4.	IS:3975	Steel wires for armouring of cables
5.	IS: 2633	Method of testing weight, thickness and uniformity of coating on hot dipped galvanized articles
6.	IS:209	Specification of zinc
7.	IS:3961 (Part – II)	Recommended current ratings for PVC sheathed heavy duty cables
8.	IS:10418	Wooden drums for electric cables
9.	IEC:502	Extruded solid dielectric insulated power cables for rated voltages from 1 kV to 30 kV
10.	IEC:40 & 540 A	Test method for insulation and sheaths of electric cables and cords.
11.	IS:10462	Fictious calculation method for determination of dimensions of protective coverings of elastomeric and thermoplastic insulated cables
12.	IS:10810 (Part – 58)	Oxygen Index Test

General Construction:

The cables shall be suitable for laying in trays, trenches and for underground buried installation with

uncontrolled backfill and possibility of flooding by water and chemicals.

Outer sheath of all XLPE cables shall be black in colour. In addition, suitable chemicals shall be added into the PVC compound of the outer sheath to protect the cable against rodent and termite attack.

Sequential marking of the length of the cable in metres shall be provided on the outer sheath at every one metre. The embossing shall be legible and indelible.

The overall diameter of the cables shall be strictly as per the values declared in the technical information furnished before taking up the job subject to a maximum tolerance of +2 mm.

PVC / Rubber end caps shall be supplied free of cost for each drum. In addition, ends of the cables shall be properly sealed with caps to avoid ingress of water during transportation and storage.

Specification for XLPE cables

The conductor shall be stranded and compacted circular for all cables.

d. All cables shall be rated 1.1 kV.
e. The core insulation shall be with cross – linked polyethylene insulating compound applied by extrusion. It shall be free from voids and shall withstand all mechanical and thermal stress under steady state and transient operating conditions. It shall conform to the properties given in table – I of IS:7098 (Part – II)
f. The XLPE insulation shall be extruded and the core identification shall be by coloured strips or by printed numerals.
g. The inner sheath shall be applied over the laid up cores by extrusion and shall conform to the requirements of type ST – 2 compound of IS:5831. The extruded inner sheath shall be of uniform thickness. For multicore cables, the armouringshall be by galvanized round steel wire and in case of single core cables, H grade hard drawn aluminium round wire of 2.5Sq. mm diameter.
h. The outer sheath of the cables shall be applied by extrusion after the armouring and shall be of PVC compound conforming to the requirement of type of IS: 5831. The thickness of outer sheath shall be as per amendment No. 1 to Table 5 of IS: 7098 part 2. (Column 3 & for both armoured and unarmoured cables)

Fire performance of outer sheath shall be as follows:

8. Critical Oxygen index shall be more than 33%
9. Temperature index shall be more than 350^{o}C
10. Smoke density (Light transmission) shall be more than 50%
11. Acid gas generation shall be less than 20%
12. Flammability shall be as per IEC 332-1 and IS 694: 1990
13. Volume resistivity shall be as per IS 1554/694
14. Thickness of insulation shall not be less than 0.8mm

i. The dimensions of the insulation, inner sheath and armour materials shall be governed by values given in Tables 2, 3 and 4 (Method ‘b’) of IS: 7098 part – II.
j. After completion of manufacture of cables and prior to dispatch the cables shall be subject to special tests as detailed below. BARC reserves the right to witness all tests with sufficient advance notice from vendor. The test reports for all cables shall be got approved from the Engineer before the dispatch of the cables.
k. All routine tests, acceptance tests and type tests shall be carried out on cables as listed in IS: 1554 part – I.
l. The inner and outer sheath of XLPE cables shall be subjected to all the tests applicable for PVC cables. The test requirement for insulation and sheath of PVC cables shall be as per latest revision of IS:5831.
m. Following are the special tests to be performed on the cables and test results shall be submitted to BARC.
   vi. Accelerated water absorption test for insulation as per NEMA – WC – 7 for XLPE insulated cables
   vii. Dielectric Retention Test: The dielectric strength of the cable insulation tested in accordance with NEMA WC – 7 at 75 +1 deg shall not be less than 50% of the original dielectric

strength.

viii. Oxygen Index Test: The test shall be carried out as per ASTMD 2863 or applicable Indian Standard specification.

ix. Test for rodent and termite repulsion property.

x. The vendors shall furnish the test details for analyse the property by chemical method.

n. Cable Accessories:

Type test should have been carried out to prove the general qualities and design of given type of termination / jointing system. The type test shall include the following tests conforming to VDE 0278 / IS specification. The type test certificates shall be submitted to the Engineer In – charge.

xiii. Rated withstand AC voltage test
xiv. Partial discharge test
xv. Rated Withstand surge voltage test
xvi. Continuous AC voltage test with cyclic current load (Number of heating cycles – 3)
xvii. Partial discharge test
xviii. Continuous AC voltage test with cyclic current load (Number of heating cycles – 60)
xix. Thermal short circuit test
xx. Continuous AC voltage test with cyclic current load
xxi. Rated withstand surge voltage test
xxii. D. C voltage test
xxiii. Test under the influence of moisture
xxiv. Dynamic short circuit test

o. Packing and Marking:

Cables shall be dispatched in non – returnable wooden drums of suitable barrel diameter, securely battened with the take – off end fully protected against mechanical damage. The wood used for construction of the drum shall be properly seasoned, sound and free parts used shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit or storage.

On the flange of the drum necessary information such as project title " BARC , NRB, INRP", manufacturer's name, type size, voltage, drum no, cable code, BIS certification direction of rotation of the drum etc shall be provided.

p. Cables shall be supplied in drum lengths as follows:

a. Medium voltage power cables upto and including 6 Sq. mm – 1000 metre
b. Medium voltage power cables from 10 sq. mm to 300 Sq. mm – 500 metre
c. Control cables upto and including 27 cores 1000 metre
d. A tolerance of plus or minus 5% shall be permissible for each drum. However overall tolerance on each size of cable shall be limited to +2%.

Approved Makes:KEC / Universal / Insucon/ Gupta Power cables / Polycab

71. Underground Laying and Dressing of Power cables upto working voltage 1.1 kV as per IS 1255 - 1983.	
IV. Power cable (2XWY (P)) of size 4C x 25 Sq.mm, Annealed copper conductor, Multistranded, round wire Armoured, XLPE insulated, cores laid up with HR PVC type inner sheath and outer sheath ZHLS of extruded PVC type ST2(P) and ST2(Y), of 1.1 kV grade as per IS 7098 (part - 1) 1988	**Qty-500 Mtrs**
V. Power cable (2XWY (P)) of size 3.5C x 50 Sq.mm, Annealed copper conductor, Multistranded, round wire Armoured, XLPE insulated, cores laid up with HR PVC type inner sheath and outer sheath ZHLS of extruded PVC type ST2(P) and ST2(Y), of 1.1 kV grade as per IS 7098 (part - 1) 1988.	**Qty-300 Mtrs**
VI. 3C x 1.5 Sq.mm Unarmored Copper Flexible cable This specification covers the requirement for design, manufacture and supply of XLPE insulated PVC sheathed FRLS cables for medium and High voltage systems and cable joining / terminating accessories for high voltage / low voltage systems. for working voltage 1.1 kV	**Qty-200 Mtrs**
72. Supply of weather proof, Brass, double compression type cable glands suitable for cable of following sizes.	
I. 4C x 25 Sq.mm, Multistranded, round wire armoured, XLPE insulated, Copper conductor	**Qty- 10 Nos**

II. 3.5C x 50 Sq.mm, Multistranded, round wire armoured, XLPE insulated, Copper conductor	**Qty- 6 Nos**

1. Material: Supplied in BRASS as Standard
2. Finish: Nickel Plated
3. Sealing Ring: Neoprene
4. Protection Class: IP 67
5. Ref Standard: BS – 6121
6. Application: Generally, for armored cables and Outdoor use
7. **Approved Make**: BRACO / Dowells.

73. Supply of Copper Lugs suitable for cable/ conductor of following sizes.

I. 3.5C x 50 Sq. mm, copper- Ring	**Qty-20 Nos**
II. 4C x 25 Sq.mm, copper- Ring	**Qty-1200 Nos**
III. 3C x 1.5 Sq. mm, copper- Ring	**Qty-1200 Nos**
IV. 3C x 1.5 Sq. mm, copper0-Pin	**Qty-1000 Nos**

Technical Details: For Copper Lugs

a. Material: Copper, Pin type and Ring type (IS – 1897).
b. Finish: Electro tinned
c. Reference Standard: IS – 8309
d. Approvals: BIS
e. Size: 3.5C×50 Sq.mm, 4C×25 Sq.mm, 3C×1.5 Sq.mm
f. Application: Generally, for Power and control wiring.
g. Approved Make: BRACO / Dowells

74. Glanding and End Termination of power cable of following sizes

I. 3.5C x 50 Sq. mm, copper	**Qty- 10 Nos**
II. 4C x 25 Sq.mm, copper	**Qty- 300 Nos**
III. 3C x 1.5 Sq. mm, copper	**Qty- 500 Nos**

Glanding and End termination shall be done at terminal point where the conductor and cable insulation will be terminated, terminations shall be made in a neat, workman like and approved manner by men specialists in this class of work. Terminations shall be made by the contractor for each type of wire or cable in accordance with instructions issued by cable manufacturer.

1. Control cable terminations shall be made in accordance with the approved wiring diagram / cable interconnection diagram and cable schedule. It is the intent that the contractor shall terminate the cables which were installed and while testing, reversal or other rearrangement of terminations are necessary, the same shall be carried out by contractor at no extra cost.

2. All new cables shall be megger tested before jointing. After jointing is completed all L. T cable shall be megger – tested using 1000 V Megger. Cables cores shall be tested for:

a. Continuity

b. Absence of cross phasing

c. Insulation resistance to earth

d. Insulation resistance between conductors

4. Approved Make: Braco / Dowells.

75. Excavation in all type of soils of width as specified in the technical specifications as per the size and the no of runs and a depth of 1500 mm below ground level, crushed sand bedding, Laying of baked bricks on side and top, back filling, dewatering, consolidation shoring, disposal of excess earth. Item includes supply of crushed sand and class - I bricks,	**Qty- 200 Cu. Meter**

1. The soil should be excavated for the minimum average depth and width as per direction of engineer-in-charge for laying of power cable. Total runs for 3.5C×50 sq. mm, 1.1 kV, 2XWY power cable is 1, for 4C× 16 sq. mm, 1.1kV, 2XWY power cable is 1.
2. After laying of cables, trenches should be covered properly by the soils.
3. The excavation of trenches for laying of cables in all solids except soft and hard rock up to a depth not exceeding 1.2 m depth including shoring and dewatering if necessary and refilling in trenches with selected excavated material in layers etc. and disposing of the surplus earth within distance of 50 m.

4. For the cables the brick size of 9” to be covered on three sides.
5. Sufficient sand should be covered on all the three sides to prevent the seepage of water surrounding the cables.
6. Supply of good quality manufactured sands and class – I bricks is in the scope of the contractor.
7. Class-I bricks shall be tested in BARC Laboratory before installation.

76. Providing, laying and fixing 250 mm dia RCC pipe NP2 class(light duty) inclusive of road cutting of width 800mm and depth 1000 mm complete with RCC collars, jointing with cement mortar 1:2(1 cement: 2 fine sand), 100mm thick encasing the pipe with concrete of 1:2:4 grade, backfilling and concreting (1:2:4) with M30 grade of 200mm thick and as per the attached drawing,	**Qty- 75 Mtrs**

1. **R.C.C. SPUN PIPES**

The pipes shall be R.C.C. spun pipes NP2 class, confirming to I.S. 458-2003 and shall be approved by the Engineer-In-Charge for soundness before incorporation in the work.

2. **LAYING R.C.C. SPUN PIPES**

The work consists of providing, laying, fixing and testing R.C.C. spun pipe of 250mm diameter including excavation and road cutting up to the depth 1000mm with modern tool and machinery.After the cement concrete cradle has been laid properly, if specified or as directed by the Engineer-in- Charge, the pipes shall be lowered gradually into the trenches over the concrete cradle or bed. Necessary working space/gap for collars shall be made at every joint. Laying of pipe shall proceed upgrade of a slope. The collars shall be slipped-on before the next pipe is laid. The pipe drain shall rest on the bed at every point through its length. To ensure this the space between the underside of the pipe on the invert of the cradle shall be carefully grouted solid with cement slurry consisting of one part of cement to one part of clean washed sand in such a manner that no void is left. It shall be ensured that the load of the pipes and the super imposed load of the earth filling is evenly distributed on the cradle or bed. The contractor shall take precautions to see that no dirt, earth or other foreign matter is allowed on the surface of the cradle or bed of the pipe resting there-on, all to the full satisfaction of the Engineer-in-Charge. After the alignment and grading of the pipes is checked by the authorized representative of the Department, the grouting shall be done with specified stiff mix of cement mortar.

The cradle of concrete shall be allowed to set at least for three days before any pipe is placed on it and the contractor shall take due care in setting the pipe in the cradle so that no damage is occur to the cradle. If any damage to the cradle occurs, it shall be rectified to the satisfaction of Engineer-in-Charge and in any particular case where damage to the cradle is beyond repair in the opinion of the Engineer-in-Charge, the contractor shall cut out the damaged section of the cradle and re do the same at his own expenses to the complete satisfaction of the Engineer-in-Charge.

No pipe shall be laid or placed till the alignment of the pipe and gradient have been carefully checked and found correct/approved by the Engineer-in-Charge.

3. **JOINTS**

The joints for the pipes shall be made by loose collars and the connecting space shall be as minimum as possible. The collars shall be specifically roughened inside to provide a better grip. The two adjacent pipes will be so designed and manufactured that when butted together concentrically, a dowel is left between the two ends. In this dowel, cement mortar of (1:2) proportion or mix. as specified in the schedule be filled and then between the ends a paste of cement mortar of the same proportions will be placed. The space remaining between the pipe ends and the collar being then caulked with cement mortar of (1:2) or other specified proportion so that an even space appears all round the external diameter of the pipes. All the joints shall be finished off smooth at an angle of 45 degrees with the longitudinal axis of the pipe on either side of the collars.

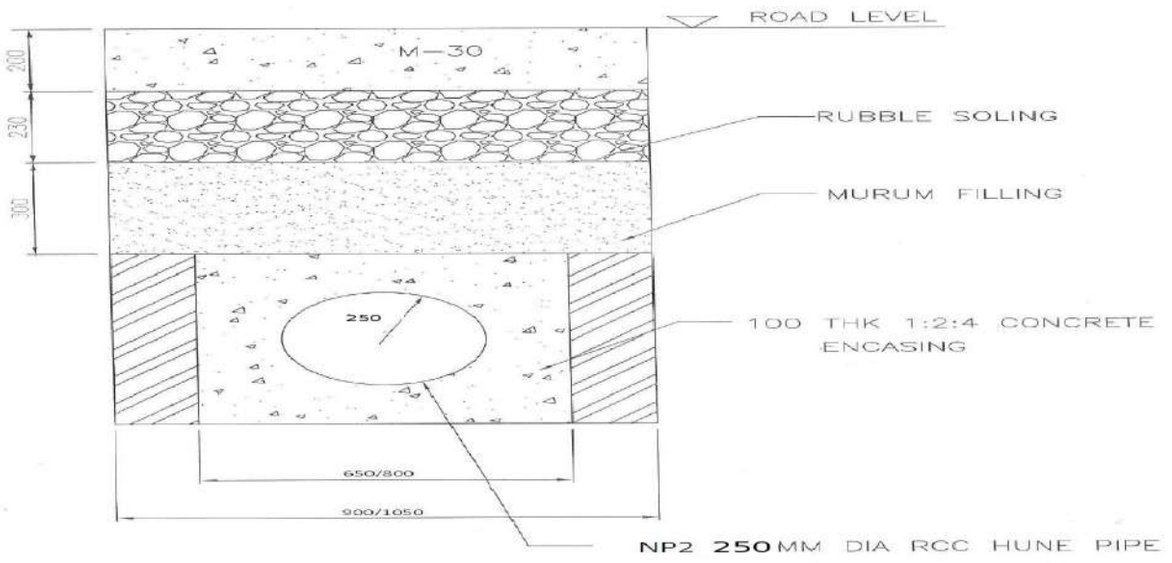
The interior of the pipe drains shall be cleaned off all dirt, cement mortar and superfluous materials and joints shall be cured for at least 7 days.

4. **BACK FILLING/ FILLING TRENCHES**

Filling in trenches for pipes and drains shall be commenced as soon as the joints of pipes and drains have been tested and passed.Where the trenches are excavated in soil, the filling shall be done as per the drawing attached in subsequent layers of murum, rubble soling and M-30 grade concrete. The filling shall be done with earth on the sides and top of pipes in layers not exceeding 20 cm. watered, rammed and consolidated, taking care that no damage is caused to the pipe below.

5. **MODE OF MEASUREMENT**

The length of pipes shall be measured in running meter nearest to a centimeter along the center line of the pipes over all fittings such as collars, bends, junctions etc. Fittings/specials shall not be measured separately. The rate shall include the cost of materials and labour including excavation of soil, jointing, grouting, cutting of pipes to the required lengths, wastages etc. involved in all the operations described above.



ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.
DIMENSIONS NOT TO BE SCALED OFF.

77. Supply, Fabrication and Installation of Standard steel sections Hot dip galvanized as per grade B0 for cable support and chamber over. Fabrication shall include drilling, entitling, welding, wire brush cleaning, supply of all consumables like gas, welding rods	**Qty- 2 ton**

i. All the M. S supports supplied shall be soot blasted and cleaned for corrosion free.
ii. All the M. S supports shall be primer coated with zinc oxide and epoxy painted with dark grey colour shade.
iii. After carrying out welding and cutting jobs the same shall be cleaned with wire brush and same shall be primer coated and painted.

78. Supply and Assembling of Fibre glass reinforced Plastic mobile telescopic ladder with Type IA duty rating of height 25 feet as per the attached technical specification	**Qty- 4 Nos**

1. The fibre glass reinforced plastic telescopic tilting ladder shall be of mobile type.
2. The ladders shall be designed and manufactured to meet the applicable standards & requirements of the national (IS) as well as International standards like American National Standards Institute (ANSI A14.5), OSHA etc.
3. The duty rating shall be IA i.e., suitable for extra heavy duty industrial type usage
4. The ladder shall be non conductive and corrosion resistant
5. The side rails shall be made from pultruded channel.
6. It shall be flame retardant.
7. It shall have high strength to weight ration.
8. It shall be shock proof and UV stabilized.
9. It shall have low thermal conductivity.
10. The capacity of the ladder shall be restricted to 300 LBS.

1. **Approved Make**: Sumip Composites Pvt. Ltd / Ercon

79. Supply and embedment of 40 mm dia. G.I. pipe (medium class) in pole foundation (during casting) separately for cable entry and cable exit including bending the pipe to the required shape complete as required	**Qty-400 Mtrs**

a. The scope of work includes supply and embedment of 40NB Sch40 ERW G.I. pipe (medium class) in the pole foundation separately for cable entry and cable exit including bending the pipe to the required shape as per drawing and site conditions.
b. IS Standard: IS 1239
c. Protection and Packing: in accordance with IS 4740.
d. **Approved Make:**Maharashtra Seamless Limited/ Zenith Birla (India) Limited/ Tata Steel Pipes

80. Supply of 8 SWG stranded, flexible G.I wire for street light pole earthing,	**Qty-1200 Mtrs**

1. The scope of work includes supply and laying of stranded, flexiblehot dip galvanized MS solid wire of size 8 SWG (4 mm) diameter.
2. **Standards:**

Sr. No.	Standard	Description of Standard
1	IS 280/ 1978	Specification for Mild Steel Wire for general engineering purpose.
2	IS 4826/ 1979	"Specification for Hot Dipped Galvanized coating on round steel wires."
3	IS: 1867/1967	'General requirements for the supply to metallurgical materials.'
4	IS : 7887/1992	Specification for Mild Steel Wire Rods for general engineering purpose.
5	IS : 1521/1972	'Method for tensile testing of steel wires.
6	IS : 1755/1983	'Method for wrapping test of wire'.
7	IS : 2633/1986	'Methods for testing uniformity of coating on zinc coated articles'.
8	IS : 6745/1972	'Methods of determination of weight of zinc coating on zinc coated iron and steel articles'.
9	IS : 209/1992	'Specification for zinc.'
10	IS : 2629/1985	'Recommended practice for hot dip galvanizing of steel and iron'.

3. The wire shall be sound-free from splits, surface flares, rough, jagged and imperfect edges and other harmful surface defects.
4. **Size**: 8 SWG (4.00 mm) dia.
5. **Zinc Coating:**
   The wire shall be galvanized in accordance with IS:2629/ 1985 and the zinc to be used for Hot dip galvanizing shall confirm to grade Zn-98, specified in IS:209/ 1992. The coating shall be uniform, smooth and free from visual defect such as flash and dress inclusion bare patches, black spots, pimples, lumpiness, rust strains, bulky white deposit and bistros. The coating shall be “Heavily Coated Quality”.

6. **Tests:**
   The following acceptance tests shall be carried out on each and every lot at manufacturers’ premises at the manufacturer's cost. The manufacturermust be fully equipped to carry out the tests at his premises in presenceof Department's Inspectors.

   i. Visual examination
   ii. Checking of diameters of wires
   iii. Tensile strength
   iv. Wrapping test
   v. Mass of zinc coating
   vi. Uniformity of zinc coating
   vii. Adhesion of zinc coating

   The manufacturer shall have to submit Test Certificates with every lot for the chemical composition of the steel rods from which the wires are drawn.

7. The sampling for Acceptance Test shall be carried out as per Appendix -'A' of IS: 280/1978.
8. Packing shall be as per IS: 280-1979 with latest amendments and marking shall be as per IS: 280-1972 with latest amendments.
9. The manufacturer shall keep coils ready with seal wire and lead seal so as to enable the Department's inspectors to seal the inspected materialimmediately. Wrapping of coils with hession shall be done after inspectionbut before dispatch.
10. For street light pole earthing the flexible G.I wire shall be directly buried in ground at minimum depth of 1000mm and its other end shall be connected to the earth stud of pole.Eachpoleshould be double earthed with 8 SWG GI wires.
11. The flexible G.I wire shall be securely connected at the other end to the earth stud provided on the pole by

soldered or preferably crimped lug, bolt, nut and washer.

81. Laying of 8 SWG stranded, flexible G.I wire in 25mm dia G.I. pipe electrode buried in ground at minimum depth of 1000mm for street light pole earthing including end connection, excavation and re- filling etc as per instructions by Engineer-In-Charge.	**Qty- 1200 Mtrs**
82. Supply, Installation and Commissioning of Copper Earth Plate 600 mm x 600 mm x 3 mm thick of high grade quality including accessories and providing PCC enclosure with Chequered cover plate hot dip galvanised having lifting lug and locking arrangement and watering pipe of 2.7 metre length with charcoal / coke and salt as per IS 3043 standard, technical specification and drawing	**Qty- 4 Nos**

a. 600 mm x 600 mm x 3 mm thick copper plate of weight 10.5 kg of high conductivity grade material
b. 20 mm dia. G. I pipe (medium class)
c. M. S Chequered plate hinged to frame with locking arrangement and duly prime coated and painted with silver colour.
d. **Hot dip galvanized** Funnel
e. G. I nuts and through bolts with washer of suitable dimensions
f. **RCC Chamber** shall be provided
g. Cement
h. Fine sand

i. Installation shall be done as per IS 3043.

a. Plate Electrode shall be buried in ground with its faces vertical and its top not less than 3.0 metre below the ground level.
b. When more than one electrode is to be installed a separation of not less than 2 m shall be maintained between two adjacent electrodes.
c. The strip or conductor electrode shall be buried in trench not less than 0.5 m deep.
d. If conditions necessitate the use of more than one strip or conductor electrode, they shall be laid as widely distributed as possible in a single straight trench where feasible, or preferably in a number of trenches radiating from one point.
e. If the electrode cannot be laid in a straight length, it may be laid in a zigzag manner with a deviation upto 45 deg from the axis of the strip. It can also be laid in the form of an arc with curvature more than 1 m or a polygon.

f. Artificial treatment of soil

The electrode shall be surrounded by charcoal / coke and salt as indicated in the drawing. In such cases, excavation for earth

electrode shall be increased as per the dimensions indicated in the drawing.

g. **Watering arrangement**:

1. A watering pipe of M. O. C: G. I of 20 mm dia. Medium class pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided on the top of this pipe for watering the earth.
2. The watering funnel attachment shall be housed in a masonry enclosure of size not less than 30cm x 30cm x 30cm.

h. A Mild steel frame with Chequered plate cover of 6 mm thick and having locking arrangement shall be suitably embedded in masonry enclosure.
i. The earthing conductor shall be secured using a through bolt, nuts and washers and terminating socket.
j. The earthing conductor from the electrode up to the building shall be protected from mechanical injury by a medium class, 15mm dia. G. I pipe in the case of wire and by 40 mm dia medium class GI pipe in the case of strip. The protection pipe in ground shall be buried at least 30 cm deep (to be increased to 60 cm in case of road crossing and pavements). The portion within the building shall be recessed in walls and floors to adequate depth in due co-ordination with the building work.
k. The earthing conductor shall be securely connected at the other end to the earth stud / earth bar provided on the switch board by:
    a. Soldered or preferably crimped lug, bolt, nut and washer in the case of wire and
    b. Bolt, nut and washer in case of strip conductor.

l. Loop earthing / Earth continuity conductor

a. Earth terminal of every switchboard in the distribution system shall be

bonded to the earth bar / terminal of the upstream switch board by protective conductor.

b. Two protective conductors shall be provided for a switchboard carrying a 3 phase switchgear thereon.

c. Loop earthing of individual units will not be however necessary in the case of cubicle type switchboards.

d. The earth connector in every distribution board shall be securely connected to the earth stud / earth bar of the corresponding switch board by a protective conductor.

e. The earth pin of socket outlets as well as metallic body of fan regulators shall be connected to the earth stud in switch boxes by protective conductor, Where the switch boxes are of non – metallic type, these shall be looped at the socket earth terminals, or at an independent screwed connector in – side the switch box. Twisted earth connections shall not be accepted in any case.

m. Earth Resistance:

a. The earth resistance at each electrode shall be measured. No earth electrode shall have a greater ohmic resistance than 5 ohms as measured by an approved earth testing apparatus. In rocky soil the resistance may be up to 8 ohms.

b. Where the above stated earth resistance is not achieved, necessary improvement shall be made by additional provisions, such as additional electrode(s), different type of electrode, or artificial chemical treatment of soil as directed by the Engineer – in – Charge.

n.Marking

a. Earth bars / terminals at all switch boards shall be marked permanently, either as "E" or as

b. Main earthing terminal shall be marked "SAFETY EARTH – DO NOT DISCONNECT"

j. Marking is to be done in each earth pit along with the serial number of earth pits and measured value of resistance with date of testing. the necessary test readings shall be submitted to the Engineer – In charge along with the three sets of AUTOCAD drawing mentioning the serial number of earth pits and corresponding values.

k. Approved Make: Ashlok Safe Earthing Electrode / Duval Messein / Hex/Metal tube and rolling mills / Omega

83. Supply and embedment of 25 mm dia. G.I. pipe electrode (medium class) for individual pole earthing	**Qty-700 Mtrs**
84. Providing and fixing Rough Shahbad Stone of minimum 50 mm average thickness of size 600 X 600 mm (Approximate) over 150 mm thick (consolidated thickness) stone dust backing including setting in position in footpath to the required level and line Pointing with C.M 1:4 (using crushed sand). Joint shall be 20 to 25 mm wide including filling of joints with cement mortar and making grooves etc. complete as per the direction of Engineer-in-charge,	**Qty- 500 Mtrs**
85. Removal of Rough Shahbad Stone of minimum 50 mm average thickness of size 600 X 600 mm (Approximate) over 150 mm thick (consolidated thickness) stone dust backing as per the instruction of EIC	**Qty-500 Mtrs**
86. Earth Work excavation by mechanical means (Hydraulic excavator) / manual means in all types of soil & soft rock. Dressing the sides of foundation, ramming of foundations etc. Including shoring and dewatering (if necessary) and refilling with selected excavated earth in layers of not more than 500 mm thick, each layer well rammed and consolidated including disposing the surplus earth within a distance of 200 m all as per specifications and as directed by the Engineer-in-charge.It should be with cable laying specs	**Qty- 250 Mtrs**
87. Murum Filling under floors of specified thick in layers of not more than 150 mm thick including supplying required materials and consolidation etc. complete (Murum to be brought from outside campus of BARC)	**Qty- 10 Cu. meter**

1. FILL AND BACK FILLING:

All fill material will be subjected to the approval of Engineer-In-charge. If any material is rejected by the Engineer-In-charge the contractor shall remove the same forthwith from thesite at no extra cost to the owner. Surplus fill material shall be deposited /disposed off as directed by the Engineer-In-charge after the fill work is complete.

No earth fill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with as directed by the Engineer-In-charge. To the extent available selected surplus spoils from excavated materials shall be used as backfill. Fill material shall be free from clods, salts, sulphates, organic or other foreign material. All clods of earth shall be broken or removed. Where excavated material is

mostly rock, the boulders shall be broken into pieces not larger than 150 mm size, mixed with properly graded fine material consisting of murrum or earth to fill up the mixture used for filling.

If any selected fill material is required to be borrowed, contractor shall make arrangements for bringing such material from outside borrow pits. The material and source shall be subject to prior approval of the Engineer-In-charge. The approved borrow pit area shall be cleared of all bushes, roots of trees, plants, rubbish etc. Top soil containing salts/ sulphates and other foreign material shall be removed. The materials so removed shall be burnt or disposed off as directed by the Engineer-In-charge. The contractor shall make necessary access roads to borrow areas and maintain the same at his own cost if such access road does not exist.

As soon as the work in foundations has been accepted and measured the spaces around the foundations, structures, pits, trenches etc. shall be cleared of all debris and filled with selected/ approved earth in layers not exceeding 150 mm each layer being watered, rammed and properly consolidated before the succeeding one is laid. Each layer shall be consolidated to the full satisfaction of the Engineer-In-charge. Filled earth shall be rammed with approved compaction method. Usually no manual compaction shall be allowed unless the Engineer-In-charge is satisfied that in some cases manual compaction by tampers cannot be avoided. The final back-fill surfaces shall be trimmed and leveled to proper profile as directed by the Engineer-In-charge of indicated on the drawings.

Filling in trenches for pipes and drains shall be commenced as soon as the joints of pipes and drains have been tested and approved by the Engineer-In-charge. The backfilling material shall be properly consolidated by watering and ramming taking due care that no damage is caused to the pipes. Where the trenches are excavated in soil the filling from the bottom of the trench to the level of the centre line of the pipe shall be done by hand compaction with selected approved earth in layers not exceeding 80 mm. Backfilling above the level of the centre line of the pipe shall be done with selected earth by hand compaction of other approved means in layers not exceeding 150 mm.

In case of excavation of trenches in rock the filling up to a level 300 mm above the top of the pipe shall be done with fine materials such as earth, Murom etc. The filling up to the level of the centre line of the pipe shall be done by hand compaction in layers not exceeding 80 mm whereas the filling above the centre line of the pipe shall be done by hand compaction or approved means in layers not exceeding 150 mm. The filling from a level 300 mm above the top of the pipe to the top of the trench shall be done by hand or other approved mechanical methods with broken rock filling of size not exceeding 150 mm mixed with fine material as available to fill up the voids.

The filling in the trenches shall be carried out simultaneously on the sides of the pipe to avoid unequal pressure on the pipes.

Plinth filling shall be carried out with approved material as described hereinbefore in layers not exceeding 150 mm watered and compacted mechanically. The Engineer-In-charge may however permit manual compaction by hand tampers in case he is satisfied that mechanical compaction is not possible. When filling reaches the finished level the surface shall be flooded with water for at least 24 hours unless otherwise directed by the Engineer-In-charge. The surfaces shall then be allowed to dry and again compacted as specified above to avoid settlements at the later stage. The finished level of the filling shall be trimmed to the specified level, slope etc.

Site grading shall be carried out as indicated in the drawings and as directed by the Engineer-In-charge. Any excavation/ filling for site grading shall be carried out as specified in the specifications given above unless otherwise indicated below:

If no compaction is called for the fill may be deposited to the full height in one operation and levelled. If the fill has to be compacted, it shall be placed in layers not exceeding 225 mm and levelled uniformly and compacted as indicated in the specifications given above before the next layer is deposited.

To ensure that the fill has been compacted as specified, if required field and laboratory tests shall be carried out by owner.

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

The contractor shall protect the earth fill from being washed away by rain or damaged in any other way. If any slip occurs the contractor shall remove the affected material and make good the slip at his own cost.

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

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

If so specified the rock as obtained from excavation may be used for filling and levelling to indicate grades without further breaking. In such event filling shall be done in layers not exceeding 500 mm approximately. After rock filling to the approximate required level the void in the rocks shall be filled with finer material such as earth, broken stone etc. and area flooded so that be taken to ensure that the finer fill material does not get washed out. Over the layerso filled a 100 mm thick mixed layer of broken material and earth shall be laid and consolidated to the full satisfaction the Engineer-In-charge.

2. SAND FILLING:
At some of the places backfilling may have to be carried with local sand if directed by the Engineer-In-charge. The sand used shall be clean, medium grained and free from impurities.The filled in and sand shall be kept flooded with water for 24 hours to ensure maximum consolidation. Any temporary work required to contain sand under flooded condition shall be to the contractor's account. The surface of the consolidated sand shall be dressed to required level or slope.

Construction of floors or other structures on sand fill shall not be started until the Engineer-In-charge has instructed and approved the fill.

3. FILL DENSITY:
The compaction only where so called for in the schedule of quantities/ items shall comply with the specified (proctor/ modified proctor) density at moisture content differing not more than 4 percent from the optimum moisture content. Contractor shall demonstrate adequately by field and laboratory tests that the specified density has been obtained.

4. LEAD:
Lead for deposition/ disposal of excavated material shall be as specified in the respective item of work. For the purpose of measurement of lead the area to be excavated or filled or area on which excavated material is to be deposited/disposed off shall be divided into suitable blocks and each of the blocks the distance between the centre lines shall be taken as the lead which shall be measured by the shortest straight line route on the plan and not the actual route taken by the contractor. No extra compensation is admissible on the grounds that the lead including that for borrowed material had to be transported over marshy or 'Katcha' land/route.

5. MODE OF MEASUREMENT:
Excavation in all strata's in different components of the schedule of quantities shall be measured net and by levels. Dimensions for the purpose of payment shall be reckoned on the horizontal area of the concrete at the base for foundations of the walls, column, footings, tanks, rafts, or other foundations/structures to be built multiplied by the mean depth measured from the surface of the original ground level in accordance with drawings or as per actual whichever is minimum.

In case of excavation exceeding 1.0 meter depth then 3V : 1H in side slopes or as specified in the drawing shall be paid to the contractor. The contractor may make such allowance in his rates to provide for excavation in side slopes keeping in mind the nature of the soil and safety of excavation. Safety of the excavation work shall be the responsibility of the contractor.

No extra payment shall be paid to the contractor for providing approach ramps to facilitate carrying out the excavation work and transporting the excavated earth at the various levels.Reasonable working space not exceeding 600 mm beyond the line of PCC or actual excavation carried out whichever is less for waterproofing of basement structure wherever considered necessary in the opinion of the Engineer-In-charge will be allowed in excavation and considered for payment. However, if concentrating is proposed against the sides of excavation to place the water proofing treatment earlier to casting of foundation member over break in rock up to 225 mm beyond the theoretical fine of water proofing treatment only will be permitted and paid for.

Over break in hard rock at bottom to the extent of 225 mm in depth or actual whichever is less will be measured and paid for. If, however, the excavation in hard rock at bottom is done more than the required

limits the same will have to be made good by filling with concrete of mix 1:3:6 at the contractor's cost. For the rock excavation beyond the required profile over break in rock only will be limited to 225 mm beyond the theoretical line or actual whichever is less.

In case of rock strata intermixed with soil the excavated rock will be properly stacked as directed by the Engineer-In-charge and the volume of rock calculated on the basis of stack measurement after deducting voids @ 50% of the volume.

Unless otherwise specified the unit rates quoted for excavation in different types of materials shall also account for the basic class as specified in the item of the work. Only leads beyond the basic lead as specified will be considered as extra lead and paid for at rates quoted in the schedule after deducting the voids as specified in the items.

The rates for excavation in soft and hard rock shall include carting away the excavated rock to the required lead as indicated in the items of work and properly stacking the same as directed by the Engineer-In-charge. The rate to the quoted in hard rock excavation shall also be inclusive of all explosive and additional cost, if any, involved in protective measures as stipulated above in the specifications.

Backfilling as per specifications in the sides of foundations, columns, footings, structures, walls, tanks, rafts, trenches etc. with selected excavated material will not be paid for separately. It shall be clearly understood that the rate quoted for excavation shall include stacking of excavated material as directed and carting it back and backfilling around the foundations as specified above. Generally the material to be backfilled may be stacked temporarily up to basic lead of 50 meters unless otherwise directed by the Engineer-In-charge.

Payment for fill inside trenches, plinth or similar filling with selected excavated material will be made only after compaction as specified /directed. Cost of all other operations shall be deemed to have been covered in the rate quoted for excavation. Payment for this work will be made based on the measurement of plinth/ trench dimensions filled. If no compaction is specified/ desired such filling will not be separately paid for. In such a event the fill shall be levelled/finished to the profiles as directed at no extra cost.

Filling under floors with approved murrum which may have to be brought from outside sources shall be paid for at rates quoted. The quoted rate shall include all operations such as clearing, excavation, lead and transportation, fill, compaction etc. as specified. Actual quantity of consolidated filling limited to the dimension considered for payment for excavation only shall be measured and paid for in cubic meters.

Actual quantity of consolidated sand filling shall be measured and paid in cubic metres.

Lead to be measured from the nearest boundary of the building up to the respective point of disposal by shortest motorable route.

For lead items, 20% for both soil & soft rock, 30% for debris and 50% for hard rock towards voids shall be deducted from the truck / stack measurements (hard rock) or as specified in the item.

88. Supplying, Stacking and Laying of 230 mm Thick rubble Soling stones as under Floor base including packing with smaller stone and compacting, ramming including spreading and consolidation of blinding material, moorum etc. complete all as per specifications and as directed by the Engineer-in-charge	**Qty- 50 sq. meter**

1. SCOPE:

The work covered under this specification includes all type of soling work by rubble stone laid under floor or foundations.

2. RUBBLE SOLING:

Rubble used for soling under floors, foundations etc. shall be hard, durable rock, free from veins, flaws and other defects. The quality and size of the rubble shall be subject to the approval of the Engineer-In-charge.

Rubble shall be hand packed as directed by Engineer-In-charge. This shall be laid closely in position on the well prepared sub grade. All interstices between the stones shall be wedged in with smaller stones of suitable size well driven to ensure tight packing and complete filling of interstices. Such filling shall be carried out simultaneously with the placing in position of rubble stones and shall not lag behind.

Small interstices shall be filled with murum and well watered and rammed with mechanical (heavy) rammer or hand rammer as approved by the Engineer-In-charge. Care shall be excercised to avoid damage to the

grade beams and columns and trench wall edges while ramming.

3. MEASUREMENT:

The unit rate measurement shall be square meter for the specified thickness of rubble soling.

The linear dimensions shall be measured up to two places of decimals of a metre and are worked out correct to the two places of decimals of a square metre.

Plan areas of soling work actually done limiting to the dimensions as per drawings shall be measured for payment

The rate shall include all the materials, labour, preparation of surfaces, watering, consolidation etc.

89. Providing and laying in position cement concrete of 1:2:4 (1 cement, 2 crushed sand, 4 graded stone aggregate of nominal size 20 mm) including consolidation, finishing curing etc. complete as per specification and drawings, but excluding the cost of form work shuttering, centering and steel reinforcement Up to Plinth level complete	**Qty- 30 Cu. meter**

For plain cement concrete work, the specifications for materials viz., cement, Sand, fine and coarse aggregates and water shall be the same as that specified in Reinforced work specification. But the proportion of mix will be nominal and the ratio of fine and coarse Aggregate may be slightly adjusted within limits keeping the total volume of Aggregates to a given volume cement constant, to suit the sieve analysis of the Aggregates. Cement shall on no account be measured by volume, both it shall always Be used directly from the bags (i.e., 50 Kg/bag).

The proportion of cement, sand, aggregate for concrete of proportion 1:4:8, 1:3:6, 1:2:4 by volumes shall generally consist of quantities as given below:

Proportions of ingredients	**Quantity of materials used per bag of Cement**			
	Cement	**Sand**	**Coarse aggregate**	**Water**
1:4:8	1	130 ltrs.	272 ltrs.	39 ltrs.
1:3:6	1	102 ltrs.	204 ltrs.	34 ltrs.
1:2:4	1	68 ltrs.	136 ltrs.	30 ltrs.

The quantity of water used shall be such as to produce concrete of consistency required by the particular class or work and shall be decided by the use of slump cone. Sufficient care should be taken to see that no excess quantity of water is used. The final proportion of the aggregates and the quantity of water shall be decided by the Engineer on the basis of test in each case. The slum shall be specified for each class of work and shall in general be as follows:-

Type of Concrete	**Mix slump (Millimeters)**
Mass Concrete	50
Roads and pavements, hand finished	100
Roads and pavements, machines finished	25
Floor paving	50

All plain concrete shall be preferably mixed in a drum type power driven machine with a loading hopper, which will permit the accurate measure of various ingredients. If hand mixing is authorized, it should be done on a watertight platform.

The mixing of each batch in the concrete mixer shall continue for not less than 2 minutes after the materials and water are in the mixer. The volume of mixed materials per batch shall not exceed the manufacturer's rated capacity of the mixer. The mixer shall rotate at a peripheral speed of about 60 metres per minute.

Concrete shall be poured and consolidated in its final position within half an hour of mixing. The re-tempering of concrete, which has partially hardened, that is remixing with or without additional cement, aggregate or water shall not be permitted. Concrete in c.c. 1:2:4 will be required to be vibrated if specified

and directed by the Engineer. In case if the thickness of concrete is more than 150 mm in thickness, it may be vibrated if directed by the Engineer.

The concrete shall be cured for 10 days in ordinary weather and 15 days in cold weather. Measurements for the work done shall be exact length, breadth and depth shown or figured on the drawings or as instructed by the Engineer and after the concrete is consolidated. No extra shall be paid for excess quantity resulting from faulty workmanship.

90. Providing and laying in position Reinforced Cement concrete (RCC) OF Grade M-30 using 20mm maximum size aggregates and crushed sand of approved quality including Admixtures of approved Brand and quality (Plasticizer or super plasticizer) if required, including weigh batching, Mechanical mixing, transporting, placing, vibrating, consolidation, finishing, curing etc. Complete but excluding the cost of centering, shuttering, and reinforcement complete as per specification up to Plinth Level (Cement Concrete M-30 Grade nominal size 20 mm metal)	**Qty- 25 Cu. meter**

1. GENERAL:

The quality of materials, method, control of manufacture and transportation of all concrete work in respect of mix whether reinforced or otherwise shall confirm to the applicable portion of these specification.

The Engineer-In-Charge shall have the right to inspect the source of materials, the layout and operation of procurement and storage of materials, the concrete batching and mixing equipments and the quality control system. Such an inspection shall be arranged by the contractor and the Engineer-In-Charge's approval shall be obtained prior to starting of concrete work.

2. SCOPE:

This specification covers the general requirements for concrete to be used on jobs using on-site production facilities including requirements in regard to the quality, quantity, handling, storage of ingredients, proportioning, batching, mixing, and testing of concrete and also requirements in regard to the quality, storage, cutting, bending and fixing of reinforcement in position. This also covers the transportation of concrete from mixer to the place of final deposit and placing, curing, protecting, repairing and finishing of concrete.

3. APPLICABLE CODES & SPECIFICATIONS:

The following specifications, standards and codes are made a part of this specification. All standards, tentative specifications, codes of practices referred to herein shall be the latest edition including all applicable official amendments, revisions and additional publications. In case of discrepancy between this specification and those referred to herein this specification shall govern.

List of Indian Standards:

IS 269	Specification for ordinary, rapid hardening and low heat Portland cement.
IS 383	Specification for coarse & fine aggregate from natural source or concentrate.
IS 456	Code of practice for plain and reinforced concrete.
IS 457	Code of practice for plain and reinforced concrete for dams and other massive structures.
IS 515	Specification for natural and manufactured aggregate for use in mass concrete.
IS 516	Method of test for strength of concrete.
IS 560	Specifications for standard sand for testing of cement.
IS 1199	Method of sampling and analysis of concrete.
IS 1200 (Part II)	Method of measurement of building works.
IS 1791	Specification for batch type concrete mixers.

IS 2386 (Part I)	Method of test for aggregates for concrete: Particle size and shape.
IS 2386 (Part II)	Method of test for aggregates for concrete: Estimation of deleterious materials and organic impurities.
IS 2386 (Part III)	Method of test for aggregates for concrete : Specific gravity, density, voids, absorption and bulking.
IS 2386 (Part IV)	Method of test for aggregates for concrete : Mechanical properties.
IS 2386 (Part V)	Method of test for aggregates for concrete : Soundness.
IS 2386 (Part VI)	Measuring mortar making properties of fine aggregates.
IS 2386 (Part VII)	Method of test for Alkali aggregates reactivity.
IS 2386 (Part VIII)	Petrographic examination of aggregates.
IS 2438	Specification for roller pan mixer.
IS 2505	Specification for immersion type concrete vibrators.
IS 2506	Specification for screed board concrete vibrators.
IS 2514	Specification for concrete vibrating table.
IS 2645	Specification for integral cement water proofing compound.
IS 2722	Specification for portable swing weigh batcher for concrete.
IS 3025	Methods of sampling and test (physical and chemical) for water used in industry.
IS 3366	Specification for pan vibrator.
IS 3370 (Part I)	Code of practice for concrete structures for the storage of liquids : General.
IS 3370 (Part II)	Code of practice for concrete structures for the storage of liquids : Reinforced concrete structure.
IS 3385	Code of practice for measurement of Civil Engineering works.
IS 3414	Code of practice for design and installation of joints in buildings.
IS 3558	Code of practice for use of immersion vibrators for consolidating concrete.
IS 3935	Code of practice for composite construction.
IS 4031	Method of physical test for hydraulic cement.
IS 4656	Specification for form vibrator.
IS 7861 (Part I)	Code of practice for extreme weather concreting (for hot weather concreting).
IS 8112	Specifications for high strength ordinary Portland cement (Grade 43).
IS 10262	Code of practice for design mix.
IS 12269	Specifications for high strength ordinary Portland cement (Grade 53).
IS 13311 (Part I)	Non-destructive testing of concrete: Method of test for ultrasonic

	pulse velocity.
IS 13311 (Part II)	Non-destructive testing of concrete: Method of testing by rebound hammer.

4. MATERIALS FOR STANDARD CONCRETE:

The ingredients to be used in the manufacture of standard concrete shall consist solely of a standard type Portland cement; clean sand, natural coarse aggregate, clean water, ice, an admixture, if specifically called for on drawings or schedule of quantities.

4.1. CEMENT:

Unless otherwise specified or called for by the Engineer-In-Charge cement shall be ordinary Portland cement / Portland Pozzolana cement (Fly ash based meeting the 28 day strength requirement of OPC 43 grade cement) in 50 kg bags. The use of bulk cement will be permitted only with the approval of the Engineer-In-Charge. Changing of brand or type of cement within the same structure will not be permitted. In case it is required to change the brand of cement in the same structure, prior permission shall be obtained from the Engineer-In-Charge.

If demanded a certified report attesting to the conformity of the cement to I.S. specifications by the cement manufacturer's chemist shall be furnished to the Engineer-In-Charge.

The contractor will have to make his own arrangements for the storage of adequate quantity of cement. Cement in bulk may be stored in bins or silos, which will provide complete protection from dampness, contamination and minimize cracking and false set. Cement bags shall be stored in dry enclosed shed (storage under tarpaulins will not be permitted), well away from the outer walls and insulated from the floor to avoid contact with moisture from ground and so arranged as to provide ready access. Damaged or reclaimed or partly set cement will not be permitted to use and shall be removed from site. The storage bins and storage arrangements shall be such that there is no dead storage. Not more than 12 bags shall be stacked in any tier. The storage arrangement shall be approved by the Engineer-In-Charge. Consignment of cement shall be stored as received and shall be consumed in the order of their delivery.

Cement held storage for a period of Ninety (90) days or longer shall be tested before use in work. Should at any time the Engineer-In-Charge have reason to consider that any cement is defective, then irrespective of its origin and / or manufacturer's test certificate, such a cement shall be tested immediately at a National Test Laboratory / Departmental Laboratory or such approved laboratory and until the result of such test are found satisfactory, it shall not be used in any work.

4.2. Aggregates:

Aggregate in general designates both fine and coarse inert materials used in the manufacture of concrete. Fine Aggregate is aggregate most of which passes through 4.75 mm I.S. sieve. Coarse Aggregate is aggregate most of which retained on 4.75 mm I.S. sieve.

All fine and coarse aggregate proposed for use in the work shall be subjected to Engineer- In-Charge's approval and after specific materials have been accepted the source of supply of such materials shall not be changed without prior approval of the Engineer-In-Charge.

Aggregates shall consist of natural sand, crushed stone and gravel from source known to produce satisfactory aggregate for concrete and shall be chemically inert, strong, hard, and durable against weathering, of limited porosity and free from deleterious materials that may cause corrosion of the reinforcement or may impair the strength and/ or durability of concrete. The grading of aggregate shall be such as to produce a dense concrete of specified strength and consistency that will work readily into position without Segregation and shall be based on the "mixed design" and preliminary test on concrete specified herein after.

4.3. Sampling and Testing:

Samples of the aggregates for mixed design and determination of suitability shall be taken under the supervision of the Engineer- In-Charge and delivered to the laboratory, well in advance of the scheduled placing of concrete. Records of tests, which have been made on proposed aggregates and on concrete made from this source of aggregates shall be furnished to the Engineer- In-Charge in advance of the work for use in determining the aggregate suitability.

4.4. Storage of Aggregates:

All coarse and fine aggregates shall be stacked separately in stock piles in the material yard near the work site in bins properly constructed to avoid inter mixing of different aggregates. Contamination with the foreign

materials and earth during storage and while heaping the materials shall be avoided. The aggregate must be specified quality not only at the time of receiving at site but more so at the time of loading into mixer. Rakers shall be used for lifting the coarse aggregates from the bins or stock piles. Coarse aggregate shall be piled in layers not exceeding 1.20 meters in height to prevent coning or segregation. Each layer shall cover the entire area of the stock pile before succeeding layers are started. Aggregates that have become segregated shall be rejected. Rejected material after re-mixing may be accepted, if subsequent tests demonstrate conformity with required gradation.

4.6. Specific Gravity:

Aggregate having a specific gravity below 2.60 (saturated surface dry basis) shall not be used without special permission of the Engineer- In-Charge.

4.7. Fine Aggregate:

Fine aggregate except as noted above and for other than lightweight concrete shall consist of natural river sand (suitable for concrete, preferably from Mahad or screened sand from Khanwada or Vaitharna), crushed stone sand or crushed gravel sand stone dust confirming to I.S. 383. The sand shall be clean, sharp, hard, durable, chemically inert and free from dust, vegetable substances, adherent coating, clay, organic matter, alkalis, mica, salt or other deleterious substances which can be injurious to the setting qualities/ strength/ durability of concrete. No creek / sea sand shall be allowed.

Machine made sand will be acceptable provided the constituent rock/ gravel composition is sound, hard, dense, non-organic, uncoated and durable against weathering.

Sand shall be prepared for use by such screening or washing or both as necessary to remove all objectionable foreign matter while separating the sand grains to the required size fractions. Sand with silt content more than 3 % will not be permitted for use unless the same is washed and silt content is brought within 3% by weight.

The percentage of deleterious substances in sand delivered to the mixer shall not exceed the following:

Sr. No.	**Substances**	**Percent by weight**	
		Uncrushed	**Crushed**
1	Material finer than 75 micron I.S. sieve	3.00%	15.00%
2	Shale	1.00%	---
3	Coal and Lignite	1.00%	1.00%
4	Clay lumps	1.00%	1.00%
5	Total of all above substances including items 1 to 4 for uncrushed sand and items 3 & 4 for crushed sand.	5.00%	2.00%

unless otherwise directed or approved, the grading of sand shall be within the limits indicated hereunder:

Sr. No.	**I.S. Sieve Designation**	**Percentage passing for**			
		Zone-I	**Zone-II**	**Zone-III**	**Zone-IV**
1	10 mm	100	100	100	100
2	4.75 mm	90-100	90-100	90-100	95-100

3	2.36 mm	60-95	75-100	85-100	95-100
4	1.18 mm	30-70	55-90	75-100	90-100
5	600 micron	15-34	35-59	60-79	80-100
6	300 micron	5-20	8-30	12-40	15-50
7	150 micron	0-10	0-10	0-10	0-15

Where the grading falls outside the limits of any particular grading zone of sieves, other than 600 micron I.S. sieve by total amount not exceeding 5% (five percent), it shall be regarded as falling within the grading zone. This tolerance shall not be applied to percentage passing the 600-micron I.S. sieve or to percentage passing any other sieve size on the coarser limit of Grading Zone-I or the finer limit of Grading Zone-IV. Fine aggregates confirming to Grading Zone-IV shall not be used unless mix designs and preliminary tests have shown its suitability for producing concrete of specified strength and workability.

4.8. Coarse Aggregate:

Coarse aggregate for concrete except as noted above and for other than lightweight concrete shall confirm to I.S. 383. This shall consist of natural or crushed stone and gravel, and shall be free from elongated, flaky or laminated pieces, adhering coatings, clay lumps, coal residue, clinkers, slag, alkalis, mica, organic matter or other deleterious matter.

The coarse aggregate and fine aggregate shall be tested from time to time as required by the Engineer- In-Charge to ascertain its suitability or use in construction and the charges for testing aggregate shall be born by the contractor as specified herein after.

Crushed rock shall be screened and/or washed for the removal of dirt or dust coating if so demanded by the Engineering- In-Charge.

Coarse aggregates shall be either in single size or graded. In both cases grading shall be within the following limits:

a) Table-I

Sr. No.	I.S. Sieve Designation	Percentage passing for single sized aggregate of nominal size				
		40 mm	20 mm	16 mm	12.5 mm	10 mm
1.	63 mm	100	--	--	--	--
2.	40 mm	85-100	100	--	--	--
3.	20 mm	0-20	85-100	100	--	--
4.	16 mm	--	--	85-100	100	--
5.	12.5 mm	--	--	--	85-100	100
6.	10 mm	0-5	0-20	0-30	0-45	85-100
7.	4.75 mm	--	0-5	0-5	0-10	0-20
8.	2.36 mm	--	--	--	--	0-5

b) Table-II

Sr. No.	I.S. Sieve Designation	Percentage passing for graded aggregate of nominal size			
		40 mm	20 mm	16 mm	12.5 mm
1.	63 mm	100	--	--	--
2.	40 mm	95-100	100	--	--
3.	20 mm	30-70	95-100	100	--

4.	16 mm	--	--	90-100	100
5.	12.5 mm	--	--	--	90-100
6.	10 mm	10-35	25-55	30-70	40-85
7.	4.75 mm	0-5	0-10	0-10	0-10
8.	2.36 mm	--	--	--	--

The pieces shall be angular in shape and shall have granular or crystalline surfaces. Friable, flaky and laminated pieces, mica and shale if present shall be only in such quantities that will not in the opinion of Engineer-In-Charge affect adversely the strength and / or durability of concrete. The maximum size of coarse aggregate shall be the maximum size specified above but in no case greater than ¼ of the minimum thickness of the member provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and fill the corners of form. Plums above 160 mm and up to any reasonable size can be used in plain mass concrete work of large dimensions up to a maximum limit of 20% by volume of concrete when specially approved by the Engineer-In-Charge. For heavily reinforced concrete members the nominal maximum size of the aggregate shall be 5 mm less than the minimum clear distance between the main reinforcing bars or 5 mm less than the minimum cover to the reinforcement whichever is smaller. The amount of fine particles occurring in the Free State or as loose adherent shall not exceed 1% when determined by laboratory sedimentation tests as per I.S. 2386. After 24 hoursimmersion in water, a previously dried sample shall not have gained more than 10% of its oven dry weight in air as Determined by I.S. 2386.

The percentage of deleterious substances in the coarse aggregate delivered to the mixer shall not exceed the following:

Sr. No.	**Substances**	**Percentage by weight of aggregates**	
		Uncrushed	**Crushed**
1	Material finer than 75 micron I.S. sieve	3.00	3.00
2	Coal and lignite	1.00	1.00
3	Clay lumps	1.00	1.00
4	Sift fragments	3.00	--
5	Total of all above substances	5.00	5.00

4.9. Water:

Water used for both mixing and curing shall be free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. Potable water is generally satisfactory for mixing and curing of concrete. In case of doubt the suitability of water for making concrete shall be ascertained by the compressive strength and initial setting time test specified in I.S. 456. The sample of water taken for testing shall be typical for the water proposed to be used for concrete, due account being paid to seasonal variation. The sample shall not receive any treatment before testing other than that envisaged in the regular supply of water proposed for use in concrete. The sample shall be stored in a clean container previously rinsed out with similar water.

Average 28 days compressive strength of at least three 150 mm size concrete cubes prepared with water to be used shall not be less than 90% of the average strength of three similar concrete cubes prepared with distilled water. The cubes shall be prepared, cured and tested in accordance with the requirements of IS: 516.

The initial setting time of test block made with the appropriate test cement and the water proposed to be used shall not be less than 30 minutes and shall not differ by more than + 30 minutes from the initial setting time of control test block prepared with the appropriate test cement and distilled water. The block shall be prepared and tested in accordance with the requirements of IS: 4031 (Part 5).

Where water can be shown to contain an excess of acid, alkali, sugar or salt, Engineer-In-Charge may refuse to permit its use. As a guide the following concentration represent the maximum permissible values:

To neutralize 100 ml sample of water, using Phenolphthalein as an indicator, it should not require more than 5 ml of 0.02 normal NaOH. The details of test shall be as given in 8.1 of IS: 3025 (Part 22).

To neutralize 100 ml sample of water, using Methyl Orange as an indicator, it shouldnot require more than 25 ml of 0.02 normal H2SO4. The details of test shall be as given in 8 of IS: 3025 (Part 23).

The percentage of solids, when tested in accordance with the IS: 3025 shall not exceed the following:

Sr. No.	**Substances**	**Tested as per**	**Permissibe %**
1	Organic	IS 3025 (Part 18)	0.02% (200 mg/litre)
2	Inorganic	IS 3025 (Part 18)	0.3% (3000 mg/litre)
3	Sulphates (SO3)	IS 3025 (Part 24)	0.04% (400 mg/litre)
4	Chlorides (as Cl)	IS 3025 (Part 32)	0.20% (2000 mg/litre) for Concrete for not containing embedded steel and 0.05% (500 mg/litre) for reinforced concrete works
5	Suspended matter	IS: 3025 (Part 17)	0.20 % (2000 mg/litre

P.H. value of water shall generally be not less than 6.

2. DESIGN MIX CONCRETE:

1.1. All reinforced concrete in the work shall be "Design Mix Concrete" as defined in IS: 456 considering as 'severe' environment and cost of design mix shall be included in the item rate and no separate payment shall be made on account of this. All "Design Mix Concrete" work to be carried out under these specifications shall be in grades designated as per table below.

Use of mineral admixtures like fly ash, GGBFS, etc. shall not be permitted in the design mix unless otherwise special permission is given by the Engineer-in-Charge. Cement shall be Ordinary Portland Cement – 43 grade or Portland Pozzolana Cement (Fly ash based meeting the 28 day strength requirement of OPC 43 grade cement) only.

Group	**Grade Designation**	**Specified Characteristic Compressive Strength of 150 mm Cube at 28 days in N/mm^2**
Ordinary Concrete	M-10	10
	M-15	15
	M-20	20
Standard Concrete	M-25	25
	M-30	30
	M-35	35
	M-40	40
	M-45	45
	M-50	50
	M-55	55
High Strength Concrete	M-60	60
	M-65	65

	M-70	70
	M-75	75
	M-80	80

Note:

1) The Characteristic strength is defined as the strength of material below which not more than 5% of the test results are expected to fall.
2) In the designation of a concrete mix, letter 'M' refers to the mix and the number to the specified characteristic compressive strength of 150 mm size cube at 28 days in N/mm2.
3) The mix shall be designed to produce the grade of concrete having the required workability and characteristic strength not less than appropriate value given in the table above.

1.2. Mix Design:

This is to investigate the grading of aggregates, water cement ratio, workability and the quantity of cement required to give works cubes of the characteristic strength specified. The proportions of the mix shall be determined by weight. Adjustment of aggregate proportions due to moisture present in the aggregate shall be made. Mix proportioning shall be carried out according to the ACI standard designation 'ACI-613' or Design of concrete mixes - Road Research Note No.4, Department of Scientific and Industrial Research U.K. or I.S. 10262.

Since different cements and aggregates of different maximum size, grading, surface texture, shape and other characteristics may produce concretes of different compressive strength for the same free water cement ratio, the relationship between strength and free water cement ratio should preferably be established for the materials actually to be used. In the absence of such data, the preliminary free water cement ratio (by mass) corresponding to the target strength at 28 days may be selected from the relationship shown in Fig.1 of I.S. 10262 at page 7.

Alternately, the preliminary free water cement ratio (by mass) corresponding to the target average strength may be selected from the relationship in Fig. 2 of I.S. 10262 page at 8, using the curve corresponding to the 28 days cement strength to be used for the purpose. Other relevant items to the used with design of mix should strictly confirm to the relevant clauses and appendices of I.S. 10262. The calculated mix proportions shall be checked by means of trial batches. The contractor should refer to the item No.4 at page 12 and the Appendix 'D' (clause No. 4.1) of I.S. 10262 for neat illustration. The contractor may refer Appendix 'C' (clause 3.8) at page 16 of I.S. 10262 for an example illustrating the mix design of M-20. The free water cement ratio selected as above should be checked against the limiting water cement ratio for the requirement of durability and the lower of the two values should be adopted.

Whenever there is a change either in required strength of concrete or water cement ratio or workability or the source of aggregates and/ or cement fresh tests shall be carried out to determine the revised proportion of the mix to suit the altered conditions. While designing mix proportions over wet mixes shall always be avoided.

While fixing the value for water cement ratio for 'Design Mix' assistance may be derived from the standard graph showing the relationship between the 28 days compressive strength of concrete mixes with different water cement ratios and the 7 days compressive strength of cement tested in accordance with I.S. 269 and I.S. 8112.

It will be contractor's sole responsibility to establish the concrete mix designs for different grades of concrete specified in the work consistent with the workability required for nature of work an also taking into consideration the assumed standard deviation which will be expected at site or by establishing the standard deviation based on 30 test results at site for each grade of concrete so as to produce concrete of required strength, durability and surface finish. The materials and proportions used in making the tests to be carried out either at site or under laboratory, conditions shall be similar in all respects to those to be actually employed in the works as the object of these tests is to determine the proportions of cement, aggregates and water necessary to produce the concrete of the required consistency to give such specified strength.

1.3. Standard Deviation:

Standard deviation of concrete of each grade shall be determined separately. When results of sufficient number of tests (at least 30) are not available, then the value of standard deviation given in the table below may be assumed for design mix in the first instance. As soon as the results of the samples are available, actual calculated standard deviation shall be used and the mix designed properly.

Assumed Standard Deviation:

Sr. No.	Grade of Concrete	Assumed standard Deviation in N/mm^2
1	M10	3.5
2	M15	
3	M20	4.0
4	M25	
5	M30	5.0
6	M35	
7	M40	
8	M45	
9	M50	

Note: -the above values correspond to the site control having proper storage of cement; weigh batching of all materials; controlled addition of water; regular checking of all materials; aggregate grading and moisture content; and periodical checking of workability and strength. Where there is deviation from the above, the values given in the above table shall be increased by 1 N/mm2.

Standard Deviation Based on Test Results:

The total number of test results required to constitute and acceptable record for calculation of standard deviation shall be not less than 30. Attempts should be made to obtain the 30 test results as early as possible when a mix is used for the first time.

The calculation of the standard deviation shall be brought up to date after every change of mix design and at least once in a month.

Determination of Standard Deviation:

Concrete of each grade shall be analyzed separately to determine its standard deviation.

The standard deviation of concrete of given grade shall be calculated using the following formula from the results of individual tests of concrete of that grade obtained as specified for test strength of sample:

Estimated Standard Deviation (S) = Sqrt(X2 / (n-1))

Where X= Deviation of the individual test strength from the average strength of a sample and n = Number of sample test results.

When significant changes are made in the proportion of concrete (for example changes in materials used, mix design, equipments or technical control), the standard deviation value shall be separately calculated for such batches of concrete.

1.4. Proportioning:

The proportions which shall be decided by conducting preliminary tests shall be by weight. These proportions of cement, fine and coarse aggregates shall be maintained during subsequent concrete batching by means of weigh batchers confirming to I.S. 2722, capable of controlling the weights within one percent of the desired value. Except where it can be shown to the satisfaction of the Engineer-In-Charge that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions. The different sizes shall be stacked in separate stock piles. The grading of coarse and fine aggregates shall bechecked as frequently as possible, as determined by the Engineer-In-Charge, to ensure maintaining of grading in accordance with samples used in preliminary mix design. The material shall be stock piles well in advance of use.

The cement shall be measured by weight for design mix. Every facility should be provided to the Engineer-In-Charge for sampling and inspection of stored cement at site of work.

Only such quantity of water shall be added to the cement and aggregate in the concrete mix as to ensure dense concrete, specified surface finish, and satisfactory workability, consistent with strength stipulated for each class of concrete. The water added to the mix shall be such as not to cause segregation of materials or the collection of excessive free water on the surface of the concrete.

The water cement ratio (W/C) is defined as the weight of water in mix (including the surface moisture of the aggregate) divided by the weight of cement in the mix. The actual water cement ratio to be adopted shall be determined in each instance by the contractor and approved by the Engineer-In-Charge.

The water cement ratio specified for use by the Engineer-In-Charge shall be maintained. The contractor shall determine the water content of the aggregate as frequently as directed by the Engineer-In-Charge as the work progresses and as specified in I.S. 2386 (Part-III) and the amount of mixing water added at the mixer shall be adjusted as directed by the Engineer-In-Charge so as to maintain the specified water cement ratio. To allow for the variation in their moisture content, suitable adjustments in the weights of aggregates shall also be made.

1.5. Consistency and Slump:

Concrete shall be of a consistency and workability suitable for the conditions of the job. After the amount of water required is determined the consistency of mix shall be maintained throughout the progress of the corresponding parts of the work and approved tests e.g. slump tests, compacting factor test etc. in accordance with I.S. 1199, shall be conducted from time to time to ensure the maintenance of such consistency.

The following tabulation gives a range of workability which shall generally be used for various types of construction unless otherwise instructed by the Engineer-In-Charge:

Workability of Concrete:

Placing Condition	**Degree of Workability**	**Value of workability**
Blinding concrete' shallow sections, pavements using pavers.	Very low	0.75 - 0.80 compacting factor. Slump of 25 – 75 mm.
Mass concrete; lightly reinforced sections in slabs, beams, walls, columns, floors, hand placed pavements, canal lining; strip footings.	Low	Slump of 50–100 mm.
Heavily reinforced sections in slabs, beams, walls, columns, Slip form work; Pumped concrete	Medium	Slump of 75 – 100 mm.
Trench fill; In-situ piling. Tremie concrete	High very High	Slump of 100 – 150 mm.

1.6. Batching and Mixing of Concrete:

The material and proportions of concrete ingredients as established by the preliminary tests for the mix design shall be rigidly followed for all concrete works on the project and shall not be changed except when specifically permitted by Engineer-In-Charge.

Concrete shall be produced only by weigh batching the ingredients. The mixer and weigh batcher shall be maintained in clean serviceable condition. The accuracy of weigh batcher shall be periodically checked. They shall be set up in level on a firm base and the hopper shall be loaded evenly. The needle shall be adjusted to zero when the hopper is empty. Fine and coarse aggregates shall be weighed separately unless otherwise stated.

Volume batching will not permitted. However Engineer-In-Charge may permit volume batching by subsequent conversion of weights of ingredients into their equivalent volumes in respect of their bulk densities only in the case of small and less important pours involving concrete of not more than 0.25 cubic meters on the day when other pours involving weigh batching are not likely to be taken up.

The concrete shall be of strength as stipulated in the respective items. All concrete shall be mixed in mechanically operated batch mixers complying with I.S. 1791 and of approved make with suitable provision for correctly controlling the water delivered to the drum.

The quantity of water actually entering the drum shall be checked with the reading of the gauge or valve setting when starting a job. The test should be made while the mixer is running. The volume of the mixed material shall not exceed the manufacturer's rated mixer capacity. The batch shall be charged into the mixer so that some water will enter the drum in advance of cement and aggregate. All water shall be in the drum by the end of the first 15 seconds of the specified mixing time. Each batch shall be mixed until the concrete is uniform in colour for a minimum period of two minutes after all ingredients are in the drum.

The volume of the mixed material shall not exceed the manufacturer's rated mixer capacity. The batch shall be charged into the mixer so that some water will enter the drum in advance of cement and aggregate. All water shall be in the drum by the end of the first 15 seconds of the specified mixing time. Each batch shall be mixed until the concrete is uniform in colour for a minimum period of two minutes after all ingredients are in the drum.

The entire contents of the drum shall be discharged in one operation before the raw materials for the succeeding batches are fed into the drum.

Each time the work stops the mixer shall be cleaned out and when next commencing the mixing the first batch shall have 10% addition cement to allow for sticking in the drum.

3. SAMPLING AND TESTING OF CONCRETE:

If the Engineer-In-Charge desires facilities required for sampling materials and concrete in the field shall be provided by the contractor at no extra cost. The following equipments (in serviceable condition) with operator shall be made available at Engineer's request:

Sr. No.	**Equipment**	**Requirement**
1	Cast Iron cube moulds of 150 mm size	As required
2	Slump cone complete set with tamping rod	1 set
3	Laboratory balance to weight up to 5 kg. With sensitivity of 10 gm.	1 No.
4	Laboratory balance of 2 kg. Capacity and sensitivity of 1 gm.	1 No.
5	I.S. sieves for coarse and fine aggregates A set of measure from 0.1 litre to 5 litres.	1 set
6	Electric oven with thermostat up to 120 degree centigrade.	1 set
7	Flakiness gauge	1 No.
8	Elongation index gauge	1 No.
9	Sedimentation pipette	1 No.
10	Pyconometer	1 No.
11	Calibrated glass jar of 1 litre capacity	1 No.
12	Glass flasks and metal containers	2 No.

13	Chemical reagents like Sodium Hydroxide, Tannic Acid,	As required
14	Litmus papers etc.	As required

The concrete test cubes will be tested at Department's or site laboratory. The contractor shall make all arrangements to cure, store of concrete cubes and transport the same to the laboratory at his own cost as directed by the Engineer-In-Charge.

6.1. Sampling and Strength Test of Concrete:

The samples from fresh concrete shall be taken as per I.S. 1199 and cubes shall be made, cured and tested at 28 days in accordance with I.S. 516.

In order to get a relatively quicker idea of the quality of concrete optional test on beams for modulus of rupture at 72 (+/-)2 hrs. or at 7 days or compressive strength tests at 7 days may be carried out in addition to 28 days compressive strength tests. For this purpose the value given in table below may be taken for general guidance in case of concrete made with ordinary Portland cement. In all cases, the 28 days compressive strength specified shall alone be the criterion for acceptance or rejection of the concrete. If however, from test carried out in particular job over a reasonably long period, it has been established to the satisfaction of the Engineer-In-Charge that a suitable ratio between 28 days compressive strength and the modulus of rupture at 72 (+/-)2 hrs. or 7 days or compressive strength at 7 days may be accepted. The Engineer-In-Charge may suitable relax the frequency of 28 days compressive strength, provided the expected strength values at the specified early age are consistently met.

Optional Test Requirement of Concrete:

Sr. No.	**Grade of Concrete**	**Minimum Compressive Strength on 150 mm Cube**	**Min. Modulus of Rupture by Beam test at**	
			72(+/-) 2 hrs.	**7 days**
1	M10	7.00 N/m^2	1.20 N/m^2	1.70 N/m^2
2	M15	10.00 N/m^2	1.50 N/m^2	2.10 N/m^2
3	M20	13.50 N/m^2	1.70 N/m^2	2.40 N/m^2
4	M25	17.00 N/m^2	1.90 N/m^2	2.70 N/m^2
5	M30	20.00 N/m^2	2.10 N/m^2	3.00 N/m^2
6	M35	23.50 N/m^2	2.30 N/m^2	3.20 N/m^2
7	M40	27.00 N/m^2	2.50 N/m^2	3.40 N/m^2

6.1.1.**Frequency of Sampling:**

A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested, i.e. the sampling should be spread over the entire period of concreting and cover all mixing units.

The minimum frequency of sampling of concrete of each grade shall be in accordance with the following:

Sr. No.	**Quality of Concrete**	**Number of Sample**
1	1.00 to 5.00 m^3	One
2	6.00 to 15.00 m^3	Two

3	16.00 to 30.00 m^3	Three
4	31.00 to 50.00 m^3	Four
5	51.00 m^3 *andabove*	Four plus one additional sample for each additional 50 m^3 part thereof.

At least one sample shall be taken from each shift. Where concrete is produced at continuous production unit, such as ready-mixed concrete plant, frequency of sampling may be agreed upon mutually by suppliers and purchasers.

Three test specimens shall be made form each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7 days or at the time of striking the formwork or to determine the duration of curing or to check the testing error. Additional cubes may also be required for testing cubes cured by accelerated methods as described in I.S. 9013. The specimen shall be tested as described in I.S.516.

The test strength of the samples shall be the average of the strength of three specimens. The individual variation should not be more than (+/-) 15 percent of the average.

Slump test shall be carried out as often as demanded by the Engineer-In-Charge and invariably from the same batch of concrete from which the test cubes are made. Slump test shall be done immediately after sampling.

Standard Deviation shall be vide clause '5.3' of this specification.

7. ACCEPTANCE CRITERIA:

The concrete shall be deemed to comply with the strength requirement if:

The mean strength determined from any group of four consecutive test results complies with the appropriate limits in col. 2 of table below.

Any individual test result complies with the appropriate limits in col. 3 of table below.

Specified Grade	**Mean of the Group of 4 Non-overlapping consecutive test results in N/m^2**	**Individual Test Results in N/m^2**
(1)	**(2)**	**(3)**
M15	>fck + 0.825 x established standard deviation (rounded off to nearest 0.5 N/mm2) or, • fck + 3 N/ mm2, whichever is greater	>fck – 3 N/mm2
M20 or above	>fck + 0.825 x established standard deviation (rounded off to nearest 0.5 N/mm2) or, • fck + 4 N/ mm2, whichever is greater	>fck – 4 N/mm2

If the concrete is deemed not to comply pursuant to 7.0 above, the structural adequacy of the part affected shall be investigated and any consequential action as needed shall be taken.

Concrete of each grade shall be assessed separately. Concrete shall be assessed daily for compliance.

Concrete of each grade shall be liable to be rejected if it is porous or honey-combed, its placing has been interrupted without providing a proper construction joints, the reinforcement has been displaced beyond the tolerances specified or construction tolerances have not been met. However, the hardened concrete may be

accepted after carrying out suitable remedial measures to the satisfaction of the Engineer-In-Charge.

8. ADMIXTURES:

Admixture may be used in concrete only with the approval of the Engineer-In-Charge based upon evidence that with the passage of time neither the compressive strength nor its durability reduced. Calcium chloride shall not be used for accelerating set of the cement for any concrete containing reinforcement or embedded steel parts. When calcium chloride is permitted to be used such as in mass concrete works it shall be dissolved in water and added to the mixing water in an amount not exceed 1.5 percent of the weight of the cement in each batch of concrete. When admixtures are used the designed concrete mix shall be corrected accordingly. Admixtures shall be used as per manufacturer's instructions and in the manner and with the control specified by Engineer-in-Charge. The cost of admixtures shall be included in the item rate and no extra amount shall be paid on this account.

Where specified and approved by Engineer-In-Charge neutralized vinsol resin or/ and other approved air entraining agent may be used to procedure the specified amount of air in the concrete mix and these agents shall conform to the requirements of ASTM standard 6-260 air entraining admixture of concrete. The recommended total air content in the concrete is 4% + 1%. The method of measuring air content shall be as per I.S. 1199.

Retarding Admixtures:

Where specified and approved by the Engineer-In-Charge retarding agents shall be added to the concrete mix in quantities specified by Engineer- In-Charge.

Water Reducing Admixtures:

Where specified and approved by Engineer- In-Charge water reducing lignosulfonate mixture shall be added in quantities specified by Engineer- In-Charge. The admixtures shall be added in the form of a solution.

Water Proofing Agent:

Where specified and approved by Engineer-In-Charge chloride and sulphide free waterproofing agent shall be added in the quantities specified by Engineer-In-Charge.

Other Admixtures:

Engineer-In-Charge may at his discretion instruct contractor to use any other admixture in the concrete.

9. OPTIONAL TESTS:

If the Engineer-In-Charge desires he may order tests to be carried out on cement, sand, course aggregate, water etc. in accordance with the relevant Indian Standards. Tests on cement shall include:

i. Fitness test,
ii. Test for normal consistency
iii. Test for setting time
iv. Test for soundness
v. Test for compressive strength
vi. Test of heat of hydration (by experiment and by calculation) in accordance with I.S. 269.

Tests on sand shall include:

i. Sieve test,
ii. Test for organic impurities,
iii. Decantation test for determining clay and slit content,,
iv. Specific gravity test,
v. Test for unit weight and bulkage factor,
vi. Test for sieve analysis and fineness modulus.

Test on coarse aggregate shall include:

i. Sieve analysis
ii. Specific gravity and unit weight of dry, loose and rodded aggregate,
iii. Soundness and alkali aggregate reactivity,
iv. Petrographic examination,
v. Test for deleterious materials and organic impurities,
vi. Test for aggregate crushing value

Tests on aggregate would normally be ordered to be carried out only if Engineer-In-Charge feels the materials are not in accordance with the specifications or if the specified concrete strengths are not obtained

and shall be performed by the contractor at an approved test laboratory.

10. INSPECTION AND TESTING OF STRUCTURES:

Immediately after stripping the form work all concrete shall be carefully inspected and any defective work or small defects either removed or made good before the concrete has thoroughly hardened as instructed by the Engineer-In-Charge.

In case of doubt regarding the grade of concrete used either due to poor workmanship or based on results of cube strength tests the contractor may be asked to carry out compressive strength test of concrete on the basis of core test, ultrasonic test and/ or load test.

In case of results of cube strength are observed to be lower than the required designed strength at 28 days as per specifications, ultrasonic test shall be carried out by the digital ultrasonic concrete tester by an approved agency at the cost of the contractor.

In case the ultrasonic test do not satisfy the requirement as above the department will be at liberty to reject the concrete and the contractor has to dismantle and redo the same or carry out such remedial measures as approved by the department at the contractor's own cost.

The unit rate for concrete shall be all inclusive of making preliminary mix design and test cubes, works cubes, testing them as per specifications, slump test, optional tests etc. However, the department will test the same departmentally the contractor will have to make arrangement for transportation of the cubes to the departmental laboratory.

In case cube tests give unsatisfactory results the contractor should also conduct conclusive tests such as ultrasonic pulse test, core test etc. to prove the suitability of concrete. The cost of the conclusive tests shall have to be borne by the contractor.

If the results of ay test prove unsatisfactory or the structure shows signs of weakness undue deflection or faulty construction the contractor shall remove and rebuild the member(s) involved or carry out such other remedial measures as may be required by the Engineer-In-Charge. The contractor shall bear the cost of so doing unless the failure of the member(s) to fulfill the test conditions is approved to be solely due to faulty design. The cost of all tests shall be borne by the contractor.

11. PREPARATION PRIOR TO CONCRETE PLACEMENT, FINAL INSPECTION AND APPROVAL:

Before the concrete is actually placed in position the insides of formwork shall be inspected to see that they have been cleaned and oiled. Temporary openings shall be provided to facilitate inspection especially at bottom of columns and wall forms to permit removal of saw dust, wood shavings, binding wire, rubbish, dirt etc. Such openings/ holes shall be later suitably plugged.

The various traders shall be permitted ample time to install drainage and plumbing lines, floor and trench drain, conduits, hangers, anchors, inserts, sleeves, bolts frames and other miscellaneous embedment to be cast in the concrete as indicated on the drawing or as necessary for the proper execution of the work. All such embedment shall be correctly positioned and securely held in the forms to prevent displacement during depositing and vibrating of concrete.

Slots, openings, holes, pockets etc. shall be provided in concrete work in the positions indicated in the drawings or as directed by the Engineer-In-Charge.

Reinforcement and other items to be cast in concrete shall have clean surfaces that will not impair bond.

Prior to concrete placement all works shall be inspected and approved by the Engineer-In-Charge and if found unsatisfactory concrete shall not be poured until all defects have been corrected at contractor's cost.

Approval of Engineer-In-Charge for any and all materials and work as required herein shall not relieve contractor from his obligations to produce finished concrete in accordance with the drawings and specifications.

<u>Rain or Wash Water:</u>

i. No concrete shall be placed in wet weather or on a water covered surface. Any concrete that has been washed by heavy rains shall be entirely removed if there is any sign of cement and sand having been washed away from the concrete mixture.
ii. Before leaving unattended the work shall be covered with tarpaulins immediately after the concrete

has been placed and compacted to safe guard against damages, which may be caused by rain.

iii. Any water accumulating on the surface of the newly placed concrete shall be removed by approved means and no further concrete shall be placed thereon until such water is removed. To avoid flow of water over / around freshly placed concrete suitable drains and sumps shall be provided.

Bonding Mortar:

i. Immediately before concrete placement begins prepared surfaces except formwork which will come in contact with the concrete to be placed shall be covered with a bonding mortar of the same strength of concrete.

Transportation:

i. All buckets, containers or conveyers used for transport the concrete shall be mortar tight. All means of conveyance shall be adopted to deliver the concrete of the required consistency and plasticity without segregation or loss of slump whatever method for transportation is employed.

ii. Chute shall not be used for transport of concrete without the written permission of the Engineer-In-Charge and concrete shall not be re-handled before placing.

Contaminated Concrete:

i. Concrete must be placed in its final position before it become too stiff to work.

ii. On no account water shall be added after the initial mixing.

iii. Concrete which has become stiff or has been contaminated with foreign materials and which has not been placed within half an hour of mixing water with cement shall be rejected and disposed off as directed by the Engineer-In-Charge.

iv. All equipments used for mixing, transporting and placing of concrete shall be maintained in clean condition. All pans, buckets, hoppers, chutes, pipe lines and other equipments shall be thoroughly cleaned after each period of placement.

12. PROCEDURE FOR PLACING OF CONCRETE:

Before any concrete is placed the entire placing programme consisting of equipment, layout, proposed procedures and methods shall be submitted to Engineer-In-Charge for approval if so demanded by the Engineer-In-Charge and no concrete shall be placed until Engineer-In-Charge's approval has been obtained. Equipment for conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete during depositing without segregation of materials considering the size of the job and placement location.

Concrete shall be placed in its final position before the cement reaches its initial set and concrete shall normally be compacted in its final position within 30 minutes of leaving the mixer and once compacted it shall not be disturbed.

In all cases the concrete shall be deposited as nearly as practicable directly in its final position and shall not be re-handled or caused to flow in a manner which may cause segregation, loss of materials, displacement of reinforcement, shuttering or embedded inserts or impair its strength. For locations where direct placement is not possible and in narrow forms contractor shall provide suitable drop and Elephant Trunks to confine the movement of concrete. Special care shall be taken where concrete is dropped from a height especially if reinforcement is in the way particularly in columns and thin walls.

Except when otherwise approved by Engineer-In-Charge concrete shall be placed in the shuttering by shovels or other approved implements and shall not be dropped from a height more than one meter or handle in a manner which will cause segregation.

The following specification shall apply when placing of concrete by use of mechanical equipment is specifically called for while inviting bids or is warranted considering the nature of work involved:

Concrete placed in restricted forms by borrows, buggies, cars, sort chutes or hand shoveling shall be subjected to the requirement for vertical delivery of limited height to avoid segregation and shall deposited as nearly as practicable in its final position.

Concreting once started shall be continuous until the pour is completed. Concrete shall be placed in successive horizontal layers of uniform thickness ranging from 150 mm to 900 mm as directed by the Engineer-In-Charge. These shall be placed as rapidly as practicable to prevent the formation of cold joints or planes of weakness between each succeeding layers within the pour. The thickness of each layer shall be such that it can be deposited before the previous layer has stiffened. The bucket loads or other units of deposit shall be spotted progressively along the face of the layer with such overlap as will facilitate spreading the layer to uniform depth and texture with a minimum of shoveling. Any tendency to segregation shall be corrected by shoveling stones into mortar rather than mortar onto stones. Such a condition shall be corrected by redesign of mix or other means as directed by Engineer-In-Charge.

The top surface of each pour and bedding planes shall be approximately horizontal unless otherwise instructed.

13. COMPACTION:

Concrete shall be compacted during placing with approved vibrating equipment until the concrete has been consolidated to the maximum practicable density, is free of pockets of coarse aggregate and fits tightly against all form surfaces, reinforcement and embedded fixtures. Particular care shall be taken to ensure that all concrete placed against the form faces and into corners of forms or against hardened concrete at joints is free from voids or cavities. The use of vibrators shall be consistent with the concrete mix and caution is to be exercised not to over vibrate the concrete to the point that segregation results.

When placing in layers, which are advancing horizontally as the work progresses great care shall be exercised to ensure adequate vibration, blending and melding of the concrete between the successive layers.

The immersion vibrator shall penetrate the layer being placed and also penetrate the layer below while the under layers is still plastic to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.

Care shall be taken to prevent contact of immersion vibrators against reinforcement steel. Immersion vibrators shall not be allowed to come in contact with reinforcement steel after start of initial set. They shall also not be allowed to come into contact with forms or finished surfaces.

Formation of stone pockets or mortar poundage in corners and against faces of forms shall not be permitted. Should these occur they shall be dug out, reform and refilled to a sufficient depth and shape for thorough bonding as directed by Engineer-In-Charge.

Bleeding or free water on top of concrete being deposited into the forms shall be caused to stop the concrete pour and the condition causing this defect corrected before any further concreting is resumed.

14. CONSTRUCTION JOINTS AND KEYS:

Concrete shall be placed without interruption until completion of the part of the work between predetermined construction joints as specified therein after. Time laps between the pouring of adjoining units shall be as specified in the drawings or as directed by the Engineer-In-Charge.

If stopping of concreting becomes unavoidable anywhere a properly formed construction joints shall be made where the work is stopped.

Joints shall be either vertical or horizontal unless otherwise shown on drawing. In case of an inclined or curved member the joints shall be at right angles to the axis of the member. Vertical joints in walls shall be kept to a minimum.

Vertical joints shall be formed against a stop board and horizontal joints shall be level and wherever possible arranged so that the joint lines coincide with the architectural features of the finished work.

Batten shall be nailed to the form work to ensure a horizontal line and if directed shall also be used to form a grooved joint. For tank walls and similar work joints shall be formed as per I.S. 3370.

Concrete that is in the process of setting shall not be disturbed or shaken by traffic either on the concrete itself or upon the shuttering.

Horizontal and vertical joints and shear keys shall be located and shall confirm in details to the requirements of the plans unless otherwise directed by the Engineer-In-Charge.

<u>Column Joints:</u>

In a column joints shall be formed 75 mm below the lowest soffit of the beam including haunches if any. In flat slab construction the joint shall be 75 mm below the soffit of column capital. At least 2 hours shall elapse after depositing concrete in columns, piers or walls before depositing in beams, girders or slabs supported thereon.

<u>Beam and Slab Joints:</u>

Concrete in beam shall be placed throughout without a joint but if the joint is unavoidable the same shall be vertical and at the centre or within the middle third of the span unless otherwise shown on drawings. Where a beam intersects a girder the joints in the girder shall be offset a distance equal to twice the width of the beam

and additional reinforcement provided for shear. The joint shall be vertical throughout the full thickness of the concrete member. A joint in a slab shall be vertical and parallel to the principal reinforcement. Where it is unavoidably at right angles to the principal reinforcement the joint shall be vertical and at the middle of the span.

Vertical construction joints in water tight construction will not be permitted unless indicated on the drawings. Where a horizontal construction joint is required to resist water pressure special care shall be taken in all phases of its construction to ensure maximum water tightness.

15. DOWELS:

Dowels for concrete works not likely to be taken up in the near future shall be wrapped in tar paper and burlap.

16. MASS FOUNDATIONS:

Mass foundation shall be poured in lifts not exceeding 1.5 m in height unless otherwise indicated on the drawings or approved by Engineer-In-Charge.

17. TREATMENT OF CONSTRUCTION JOINTS ON RESUMING CONCRETING:

A dryer mix shall be used for the top lift of horizontal pours to avoid laitance. All laitance and loose stones shall be thoroughly and carefully removed by wire brushing/ hacking and surface wash.

Just before concreting is resumed the roughened joint surface shall be thoroughly cleaned and loose matter removed and then treated with a thin layer of cement grout of proportion specified by Engineer-In-Charge and worked will into the surface. The new concrete shall be well worked against the prepared face before the grout mortar sets. Special care shall be taken to obtained thorough compaction and to avoid segregation of the concrete along the joint plane. the prepared face before the groutmortar sets. Special care shall be taken to obtained thorough compaction and to avoid segregation of the concrete along the joint plane.

18. CURING, PROTECTING, REPAIRING AND FINISHING:

All concrete shall be cured by keeping it continuously damp for a period of time required for complete hydration and hardening to take place. Preference shall be given to the use of continuous sprays or by ponding of water, continuously saturated coverings of sacking, canvas, hessian (especially on vertical structural members) or other absorbent materials or approved effective curing compounds applied with spraying equipment capable of producing a smooth even textured coat. Extra precautions shall be exercised in curing concrete during cold and hot weather as outlined hereinafter.

Certain type of finish or preparation for overlaying concrete must be done at certain stages of the curing process and special treatment may be required for specific concrete surface finish.

<u>Curing With Water:</u>

i. Fresh concrete shall be kept continuously wet for a minimum period of 10 days from the date of placing of concrete following a lapse of 10 to 12 hours after laying of concrete in normal weather and in hot weather not more than lapse of 4 hours. Date of casting shall have to be marked, as directed by Engineer-in-charge, on the exposed surfaces of the concrete so as to enable easy monitoring of the curing period.
ii. The curing of horizontal surface exposed to the drying winds shall be however begin immediately after the concrete has hardened. Water shall be applied to unformed concrete surfaces within one hour after concrete has set. Water shall be applied to formed surface immediately upon removal of forms. Quantity of water applied shall be controlled so as to prevent erosion of freshly placed concrete.
iii. The quality of curing water shall be the same as that used for mixing concrete.
iv. Curing shall be assured by use of an ample water supply under pressure in pipes with all necessary appliances of hose, sprinklers and spraying devices.Continuous fine moist spraying or sprinkling shall be used unless otherwise specified or approved by the Engineer-In-Charge.
v. For curing of concrete in pavements, side-walks, floors flat roofs or other level surfaces the ponding method of curing is preferred. The method of containing the ponded water shall be approved by the Engineer-In-Charge. Special attention shall be given to edges and corners of the slab to ensure proper protection to these areas.The ponded areas shall be kept continuously filled with water during the curing period.
vi. All equipments and materials required for curing shall be on and ready for use before concrete is placed.

19. FINISHING OF CONCRETE:

This specification is intended to cover the treatment of concrete surface for all structures. Areas requiring

special finish not covered by this specification shall be clearly indicated on the drawings and special specification shall be furnished.

When specified on the drawings an integral cement concrete finish of specified thickness for floors and slabs shall be applied either monolithic or bonded as specified on the drawings and as per I.S. 2571.

The surface shall be compacted and then floated with a wooden float or power floating machine. The surface shall be tested with a straight edge and any high and low spots eliminated.

Floating or trowelling of the finish shall be permitted only after all surface water has evaporated. Dry cement or a mixture of dry cement and sand shall not be sprinkled directly on the surface of the concrete finish to absorb moisture or to stiffen the mix.

A rubbed finish shall be provided only on exposed concrete surfaces as specified on the drawings.

Upon removal of forms all fins and other projections on the surfaces shall be carefully removed, offsets leveled, voids and /or damaged sections immediately saturated with water and repaired by filling with concrete or mortar of the same composition as was used in the concrete.

The finished surfaces shall present a uniform and smooth appearance.

All concrete shall be protected against damage until final acceptance by the Engineer-In-Charge.

20. CONCRETE FINISHES:

Unless otherwise specified concrete finishes shall confirm to the following specifications :

Finish F1, F2 and F3 shall describe formed surfaces.

Finish U1, U2 and U3 shall describe unformed surfaces.

Offsets or fins caused by disposed or misplaced from sheathing, lining or form sections or by defective form lumber shall be referred to as abrupt irregularities.

All other irregularities shall be referred as gradual irregularities. Gradual irregularities shall be measured as deviation from a plane surface with a template 1500 mm long for formed surface and 3000 mm long for unformed surfaces.

Formed Surfaces:

Finish F1 shall apply to all formed surfaces for which finish F2 and F3 or any other special finish is not specified and shall include filling up all form tie holes.

Finish F2 shall apply to all formed surfaces as shown on the drawings or specified by the Engineer-In-Charge. This shall include filling all form tie holes, repair of gradual irregularities exceeding 6 mm removal of ridges and abrupt irregularities by grinding.

Finish F3 shall apply to all formed surfaces exposed to view or where shown in the drawings or specified by the Engineer-In-Charge. Finish F3 shall include all measures specified for Finish F2 and in addition filling air holes with mortar and treatment of the entire surface with sack rubbed finish. It shall also include clean up of loose and adhering debris. Where a sack rubbed finish is specified the surfaces shall be prepared within two days after removal of the forms.

The surface shall be wetted and allowed to dry slightly before mortar is applied by sack rubbing. The mortar used shall consist of one part of cement to one and half parts of fine sand (minus No.16 mesh) by volume. Only sufficient mixing water to give the mortar a workable consistency shall be used.

The mortar shall then be rubbed over the surface with a fine burlap or linen cloth so as to fill all the surface voids

The mortar rubbed in the voids shall be allowed to stiffen and solidify after which the whole surface shall be wiped clean so that the surface presents a uniform Appearance without air holes, irregularities etc

Curing of the surface shall be continued for a period of ten days

Unformed Surfaces:

Finish U1 shall apply to all unformed surfaces for which the finish U2, U3 or any other special finish is not specified and shall include screeding the surface of the concrete to the required slope and grade.

Unless the drawing specifies a horizontal surface or shows required the slope the top of the narrow surfaces such as stairs, treads, walls, curbs and parapets shall be sloped approximately 10 mm per 300 mm width.

The surfaces to be covered by back fill or concrete sub floors to be covered with concrete topping, terrazzo and similar surfaces shall be smooth screeded and leveled to produce even surface, irregularities not exceeding 6 mm.

Finish U2 shall apply to all unformed surfaces as shown in the drawing or specified by the Engineer-In-Charge and shall include screeding and applying a wood float finish to the surface of the concrete to the required slopes and grade.

Repair of abrupt irregularities unless a roughened texture is specified. Repair of gradual irregularities exceeding 6 mm. Finish U3 shall apply to unformed surfaces for which a high degree of surface smoothness is required where shown on the drawing or as specified by the Engineer-In-Charge. This shall include screeding, floating and applying a steel trowel finish to the surface of the concrete to the required slopes and grade.

Repair of abrupt irregularities and gradual irregularities exceeding 6 mm, finishing joints and edges of concrete with edging tools.

21. MODE OF MEASUREMENT:

The concrete as actually done shall be measured for payment. Any work done excess over the specified dimensions for the section shown in the drawing or as required by the Engineer-In-Charge shall not be measured for payment.

Dimensions of length, breadth and thickness shall be measured correct to nearest centimetres except for the thickness of slab, which shall be measured to nearest 5 mm.

Areas shall be worked out to nearest 0.01 square metre and the cubic contents of consolidated concrete shall be worked out to nearest 0.001 cubic metres.

For the purpose of measurements and payments for all concrete works I.S.1200 (Part-II) shall be referred.

22. Control Joint / Dummy Joint:

These joints shall be founded at 5 M to 6 M intervals. The width of the joint shall be 8 to 10 mm and the depth shall be 25 mm. The edges shall be rounded with an edging tool.

The joint shall be filled with the joint sealing compound of IS:1834-1961 for hot applied sealing compounds for joints in concrete.

The unit of measurement will be running metre including cost of sealing compound.

91. Providing Reinforcement steel for reinforced cement concrete at all levels including supplying, preparation of bar bending schedules, cutting, bending, transporting, fixing, tieing in position with 1.6 mm dia soft drawn annealed binding wire all labour charges, cost of cover blocks in specified grade of concrete etc. complete including cost of binding wire as per specifications and drawings. Using TMT Bars of specified Grades of all Sizes. TMT bars to be supplied by the contractor SAIL, RINL, JSW or TATA make only. Steel Supplied by the Contractor,	**Qty-1 Met Ton**

1. GENERAL:

Steel reinforcement bars, if supplied or arranged by the contractor, shall be either plain round mild steel bars grade – I or medium tensile steel bars as per IS: 432 or hot rolled mild steel and medium tensile deformed as per IS: 1139 or Thermo-mechanically treated (TMT) bars - high yield strength deformed bars as per IS: 1786 as shown and specified on the drawings and shall be manufactured by M/s SAIL or TISCO or RINL only and shall be rolled from their own plants and from virgin material. Materials manufactured by their authorized conversion agents and re-rollers shall not be accepted. Documentary evidence of purchasing steel produced from these manufacturers and their manufacturing test certificate shall be submitted. The third party test shall be carried out as directed in line with the relevant Indian standards and cost of which shall be included in the item rate and no separate payment shall be made on account of this.

Wire mesh or fabric shall be in accordance with IS: 1566.

Substitution of reinforcement will not be permitted except upon written approval from Engineer-In-Charge.

2. SCOPE:
This specification covers the general requirements for quality, storage, Bending and fixing of reinforcement.

3. STORAGE:
The reinforcement shall not be kept in direct contact with the ground but stacked on top of an arrangement of timber slippers or the like. The reinforcement shall be coated with cement wash before stacking to prevent scale and rust. Fabricated reinforcement shall be carefully stored to prevent damage, distortion, corrosion and deterioration.

4. APPLICABLE CODES AND SPECIFICATIONS:
The relevant IS specification, standards and codes given below are made a part of this specification. All standards, specifications, code of practices refer to herein shall be the latest edition including all applicable amendments, revisions and additional publications.

Sr. No.	IS Code	IS Particular
1	IS: 432 Part-1	Mild Steel and Medium Tensile Steel bars and Hard drawn steel wires for concrete reinforcement
2	IS: 432 Part-II	Mild Steel and Medium Tensile Steel bars and Hard drawn steel wires for concrete reinforcement
3	IS:1139	Specification for Hot Rolled Mild steel, Medium steel and HYSD bars for concrete reinforcement
4	IS:1200 Part-8	Method of Measurement of Building and Civil Engineering work (Steel and Iron works)
5	IS:1566	Hard drawn Steel Wire fabric for concrete reinforcement
6	IS:1599	Method for Bend Test
7	IS:1608	Method of Tensile Testing of Steel Products
8	IS:1786	High Strength Deformed Steel and Wires for concrete reinforcement
9	IS:2502	Code of Practice for Bending and Fixing of Bars for concrete reinforcement

5. QUALITY:
All steel shall be of Grade-I quality unless specifically permitted by the Engineer- In-Charge. No re-rolled material will be accepted. Contractor shall submit the manufacturer's test certificate for steel.

Random test on steel supplied by the contractor may be performed by owner as per relevant IS. All cost incidental to such tests shall be at the contractor's expenses. Steel not conforming to the specifications shall be rejected.

All reinforcement shall be clean, free from grease, oil, paint, dirt, loose mill scale, loose rust, dust, bituminous material or any other substance that will destroy or reduce the bond. All rods shall be thoroughly cleaned before being fabricated.

Pitted and defective rods shall not be used. All bars shall be rigidly held in position before concreting. No welding of rods to obtain continuity shall be allowed unless approved by the Engineer-in-charge. If welding is approved the work shall be carried out as per IS: 2751, according to best modern practices and as directed by the Engineer-in-charge.

In all cases of important connections, test shall be made to prove that the joints are of the full strength of the bar welded. Special precaution as specified by the Engineer-in-charge shall be taken in the welding of cold work reinforcing bars and bars other tan mild steel.

6. LAPS:

Laps and splices for reinforcement shall be as shown on the drawings. Splices and adjacent bars shall be staggered and the location of all splices except those specified on the drawings shall be approved by the Engineer-in-charge. The bars shall not be lapped unless the length required exceeds the maximum available length required of bars at site.

7. BENDING:
All bars shall be accurately bent according to the size and shape shown on the detail working drawing / bar bending schedule. They shall be gradually bent by machine or approved means.

Reinforcing bars shall not be straightened and re-bend in the manner that will injure the material. Bars containing cracks and splits shall be rejected. They shall be bent cold except bars above 25 mm in diameter which may be bent hot, if specifically approved by Engineer-in-charge.

Bars which depend for their strength on cold working shall not be bent hot. Bars bent hot shall not be heated beyond cherry-red color (not exceeding 645°C) and after bending shall be allowed to cool slowly without quenching.

Bars incorrectly bent shall be used only if the means used for straightening and re-bending be such as shall not in the opinion of the Engineer-in-charge injure the material.

No reinforcement bars shall be bent when in position in the work without approval, whether or not it is partially embedded in hardened concrete. Bars having kinks or bends other than those required by the design shall not be used.

8. FIXING:
The reinforcement shall accurately be fixed by any approved means and maintained in the correct position as shown in the drawing by use of blocks, spacers and chairs as per IS: 2502 to prevent displacement during placing and compaction of concrete.

Bars intended to be in contact at crossing point shall be securely bound together at all such points with 1.6 mm diameter annealed soft iron wire.

The vertical distance required between successive layers of bars in beams or similar members shall be maintained by provision of mild steel spacer bars at such intervals that the main bar do not perpetually sag between adjacent spacer bars.

9. COVER TO REINFORCEMENT:
Unless indicated otherwise on the drawing, clear concrete cover for reinforcement (exclusive of plaster or decorative finish) shall be as per the provisions of IS: 456.

10. INSPECTION:
Erected and secured reinforcement shall be inspected and approved by the Engineer-in-charge prior to placement of concrete.

11. MODE OF MEASUREMENT:
The actual quantity of reinforcement bars embedded in concrete as specified in the drawing and as approved by the Engineer-in-charge irrespective of the level or height at which the reinforcement bars are placed shall be measured for payment.

The reinforcement bars shall be measured in length nearest to a centimetre for different diameters and their weight shall be calculated based on the standard weights as per Indian Standard.

Wastage, unauthorized overlap and annealed steel binding wires shall not be measured for payment.

Pins, chairs and spacers wherever required shall be provided as directed by the Engineer-in-charge and measured separately and paid for.

The rate for reinforcement item shall include the cost of labour and materials required for all operations described above including transportation, cleaning, straightening, cutting, bending, placing in position and binding of reinforcement bars and wastage, etc.

92. Providing, centering, shuttering Form work by using steel plates, timber planks for all types of structures including necessary strurtting, proping, staging, supports etc and deshuttering the same after the specified time all as per drawings and specifications at all levels,	**Qty-200 sq.mtr**

1. SCOPE:

The formwork shall consist of shores, bracings, side of beams and columns, bottom of slabs, etc. including ties, anchors, hangars, inserts, etc. complete which shall be properly designed and planned for the works.

The formwork shall be so constructed that up and down vertical adjustments can be made smoothly. Wedges may be used at top or bottom of shores, but not at both the ends to facilitate vertical adjustment for dismantling of the formwork.

2. APPLICABLE CODES AND SPECIFICATIONS:

The relevant IS specification, standards and codes given below are made a part of this specification. All standards, specifications, code of practices refer to herein shall be the latest edition including all applicable amendments, revisions and additional publications.

Sr. No.	I.S. No.	I.S. Particular
1	IS:303	Plywood for general purpose
2	IS:1200 (Part V)	Method of Measurement of building and civil engineering work (Form work)
3	IS:2750	Specification for steel scaffolding
4	IS:3696	Safety code for scaffolds and ladders
5	IS:4014 (Part I)	Code of Practice for steel tubular scaffolding
6	IS: 4014 (Part II)	Code of Practice for steel tubular scaffolding
7	IS: 4990	Specification for plywood for concrete shuttering work

3. DESIGN OF FORMWORK:

The design and engineering of the formwork as well as its construction shall be the responsibility of the contractor. If so instructed, the drawings and calculations for the design of the formwork shall be submitted well in advance to the Engineer-in-charge for approval before proceeding with the work at no extra cost to the department. Engineer-in-charge's approval shall not relieve the contractor of the full responsibility for the design and construction of the formwork.

The design shall take into account all the loads vertical as well as lateral that the forms will be carrying including live load and vibration loads.

Depending upon the height of the staging suitable vertical and horizontal cross bracings shall be provided.

The contractor shall note that no concrete work of floor, beam, slab including roof slab will be permitted unless the staging work is inspected and the approval in writing for its soundness is given to the Engineer-in-charge prior to commencement of concrete work.

4. TOLERANCES:

Tolerance is a specified permissible variation from lines, grade or dimensions given in the drawings. No tolerance specified for horizontal and vertical building lines or footings shall be considered to permit encroachment beyond the legal boundaries. Unless otherwise specified, following tolerances shall be permitted –Tolerance for R.C. Building:

3.1.1.Variation from the plumb:

No.	Building Members	Tolerances
1	In the line and surface of columns, piers, walls and buttresses	5 mm per 2.50 M but not more than 25 mm
2	For exposed corner columns and other conspicuous lines	In any bay or 5 M maximum: (+/-) 5 mm. In 10 M or more: (+/-) 10 mm

4.1.2.Variation from the level or frame the grade indicated in the drawings:

No.	Building Members	Tolerances
1	In slab soffits, ceilings, beam soffits and staircases	In 2.50 M : (+/-) 5 mm In any bay or 5 M maximum: (+/-) 8 mm. In 10 M or more: (+/-) 15 mm
2	For exposed lintels, parapets, horizontal grooves and other conspicuous lines	In any bay or 5 M maximum: (+/-) 5 mm. In 10 M or more: (+/-) 10 mm

4.1.3. Variation of the linear building lines from established position in plan and relatedposition of columns, walls and partitions:

No.	Building Members	Tolerances
1	In any bay or 5 M maximum	(+/-) 5 mm
2	In 10 M or more	(+/-) 20 mm

4.1.4.

No.	Building Members	Tolerances
1	Variation in the sizes and locations of sleeves, openings in walls and floors except in the case of anchor bolts	(+/-) 5 mm

4.1.5.

No.	Building Members	Tolerances
1	Variation in cross sectional dimensions of columns and beams and thickness of slabs and walls	(-) 5 mm and (+) 10 mm.

4.1.6. Footings:

No.	Building Members	Tolerances
1	Variation in dimension in plan	(-) 5 mm and (+) 50 mm
2	Misplacement or eccentricity in the direction of misplacement	0.02 times the width of the footing in the direction of the deviation but not more than 50 mm
3	Reduction in thickness	(+/-) 0.05 times the specified Thickness

4.1.7. Variation in steps:

No.	Building Members	Tolerances
1	In a flight of stairs riser	(+/-) 3 mm
2	In a flight of stairs tread	(+/-) 5 mm
3	In consecutive steps riser	(+/-) 1.5 mm
4	In consecutive steps tread	(+/-) 3 mm

4.2. Tolerances in other Concrete structures:

4.2.1. All structures:

No.	Building Members	Tolerances
1	Variation of the constructed linear outlinefrom established position in plan	(+/-) 10 mm in 5 M (+/-) 15 mm in 10 M or more
2	Variation of dimensions to individual structure features from established positions in plan	(+/-) 25 mm in 20 M or more (+/-) 50 mm in buried Construction
3	Variation from plumb, specified batter orcurved surfaces of all structures	(+/-) 10 mm in 2.50 M (+/-) 15 mm in 5 M (+/-) 25 mm in 10 M or more (+/-) Twice the above amounts in buried construction
4	Variation from level or grade indicated ondrawings in slabs and beams soffits,horizontal grooves and visible arises	(+/-) 5 mm in 2.50 M (+/-) 10 mm in 7.5 M or more (+/-) Twice the above amounts in buried construction
5	Variation in cross sectional dimensions ofcolumns, beams, buttresses, piers and similarmembers	(-) 5 mm and (+) 10 mm
6	Variation in the thickness of slabs, walls, arch sections and similar members	(-) 5 mm and (+) 10 mm

4.2.2.Footings for columns, piers, walls, buttresses and similar members:

No.	Building Members	Tolerances
1	Variation in dimension in plan	(-) 10 mm and (+) 50 mm.
2	Misplacement or eccentricity in the direction of misplacement	0.02 times the width of the footing in the direction of the deviation but not more than 50 mm
3	Reduction in thickness	(+/-) 0.05 times the specified thickness

4.2.3.Tolerances in other types of structures shall generally conform to those given in clause 2.4 of recommended Practice for Concrete Formwork (ACI 347).

4.2.4.

5. TYPE OF FORMWORK:

Type of formwork may be timber, plywood, metal, plastic or concrete. For special finishes the formwork may be lined with plywood, steel sheets, oil tempered hard board, etc. sliding forms and slip forms may be used with the approval of EIC.

6. FORMWORK REQUIREMENTS:

Forms shall conform to the shapes, lines, grades and dimensions including camber of the concrete as called for on the drawings. Ample studs, waler braces, ties, straps, shores, etc. shall be used to hold the forms in proper position without any distortionwhatsoever until the concrete has set sufficiently to permit removal of forms. Form shall be strong enough to permit the use of immersion vibrators; in special case form vibrators may also be used. The shuttering shall be close boarded. Timber shall be well seasoned, free from sap,

shakes, loose knots, worm holes, warps or other surface defects in contact with concrete shall be free from adhering grout, plaster, paint, projecting nails, splits or other defects. Joints shall be sufficiently tight to prevent loss of water and fine material from concrete.

Plywood shall be used for exposed concrete surface where called for. Sawn and wrought timber may be used for unexposed surfaces. Inside faces of forms for concrete surface, which are to be rubbed finished shall be planed to remove irregularities or unevenness in the face. Formwork with lining will be permitted.

All new and used form timber shall be maintained in a good condition with respect to shape, strength, rigidity, water tightness, smoothness and cleanliness of surfaces. Form timber unsatisfactory in any respect shall not be used and if rejected by the Engineer-in-charge shall be removed from the site.

Shores supporting successive stories shall be placed directly over those below or be so designed and placed that the load will be transmitted directly on them. Trussed supports shall be provided for shores that can be secured on adequate foundation.

Form work during any stage of construction showing signs of distortion or disturbed to such a degree that the intended concrete work will not conform to the exact contours indicated on the drawings shall be re-positioned and strengthened. Poured concrete affected by faulty formwork shall be removed entirely and the formwork shall be corrected prior to placing new concrete.

Excessive construction camber to compensate for shrinkage settlement etc. that may impair the structural strength of the members will not be permitted.

i. Forms for substructure concrete may be omitted in the opinion of the Engineer-in-charge the open excavation is firm enough to act as the form. Such excavation shall be slightly larger than that required by drawings to compensate for irregularities in excavation and to ensure the design requirement.

ii. Forms shall be designed and constructed that they can be stripped in order required and their removal do not damage the concrete. Face form work shall provide true vertical and horizontal joints conforming to the architectural features of the structure as to location of joints and be as directed by the Engineer-in-charge.

Where exposed smooth or rubbed concrete finishes are required, the forms shall be constructed with special care so that the desired concrete surfaces could be obtained which require a minimum finish.

7. BRACINGS, STRUTS AND PROPS:

Shuttering shall be braced, strutted, propped and so supported that it shall not deform under weight and pressure of the concrete and also due to the movement of men and other materials. Bamboos shall not be used as props or cross bracings.

The shuttering for beams and slabs shall be so erected that the shuttering on the sides of the beams and under the soffit of slab can be removed without disturbing the beam bottoms.

Re-propping of the beams shall not be done except when the props have to be reinstalled to take care of construction loads anticipated being excess of the design load. Vertical props shall be supported on wedges or other measures shall be taken whereby the props can be gently lowered vertically while striking the shuttering.

If the shuttering for a column is erected for the full height of the column, one side shall be left open and built upon sections as placing of concrete proceeds or windows may be left for pouring concrete from sides to limit the drop of concrete to one meter or as directed by the engineer-in-charge.

8. FORM OIL:

Use of the form oil shall not be permitted on the surface that requires painting. If the contractor desires to use form oil on the inside of form work of the other concrete surfaces, a non staining mineral oil or other approved oil ‘CEMOL-35’ of M/s Hindustan Petroleum Co. Ltd. or equivalent may be used provided it is applied before placing of reinforcing steel and embedded parts.

All excess oil on the form surfaces and any oil on metal or other parts to be embedded in the concrete shall be carefully removed. Before treatment with oil forms shall be thoroughly cleared of dried splatter of concrete from placement of previous lift.

9. CHAMFERS AND FILLETS:

All corners and angles in the finished structure shall be formed with mouldings to form chamfers or fillets on the finished concrete. The standard dimensions of chamfers and fillets unless otherwise specified shall be 20 mm x 20 mm. Care shall be exercised to ensure accurate mouldings. The diagonal face of the moulding shall be planed or surface to the same texture as the forms to which it is attached.

Vertical construction joints on faces which will be exposed at the completion of the work shall be chamfered as above except where not permitted by Engineer-in-charge for structural or hydraulic reasons.

10. WALL TIES:

Wall ties passing through the walls shall not be allowed. Also through bolts shall not be permitted.

For fixing of formwork alternate arrangements such as coil nuts shall be adopted at the contractor's cost.

11. REUSE OF FORMS:

Before reuse all forms shall be thoroughly scraped, cleaned, nails removed, holes that may leak suitably plugged and joints examined and when necessary repaired and the inside retreated to prevent adhesion to the satisfaction of Engineer-in-charge. Warped timber shall be resized. Contractor shall equip himself with enough shuttering to complete the job in the stipulated time.

12. REMOVAL OF FORMS:

Contractor shall record in the drawings or a special register the date upon which the concrete is placed in each part of the work and the date on which the shuttering is removed there from.

In no circumstances shall form struck until the concrete reaches a strength of at least twice the stress due to self weight and any construction/erection loading to which the concrete may be subjected at the time of striking of formwork. The strength referred to shall be that of concrete using the same cement and aggregates and admixture, if any, with the same proportions and cured under conditions of temperature and moisture similar to those existing on the work.

In normal circumstances where the ambient temperature does not fall below 15oC and where Ordinary Portland Cement is used and adequate curing is done the stripping time is to be followed as specified in IS: 456-2000 (clause 11.3).

Striking shall be done slowly with utmost care to avoid damage to arise and projections and without shock or vibration by gentling easing the wedges. If after removing the formwork it is founds that timber has been embedded in the concrete, it shall be removed and made good as specified earlier.

Reinforced temporary openings shall be provided as directed by the Engineer- in-charge to facilitate removal of formwork which otherwise may be inaccessible.

Tie rods, clamps, form bolts, etc. which must be entirely removed from walls or similar structure shall be loosened not sooner than 16 hours not later than 24 hours (in case the conditions in 12.3 are satisfied) after the concrete has been deposited. Ties except those required to hold the forms in place may be removed at the same time. Ties withdrawn from walls and grade beams shall be pulled towards the inside face. Cutting ties back from the faces of forms and grade beams will not be permitted. Work damaged due to premature or careless removal of forms, any undulation in exposed concrete surface due to sag / settlement or movement of supports found after removal of shuttering shall be reconstructed or rectified to the satisfaction of theEngineer-in-charge by the contractor at his own risk and cost. Abrupt changes in surface of concrete, mortar fins at formwork joints shall be made even by chipping, grinding and finishing with cement mortar, curing, etc. as directed by Engineer-in-charge at his own cost.

13. MODE OF MEASUREMENT:

The net area of exposed surfaces of concrete members as shown in the drawings coming in contact with form work shall be measured under item of form work in square meter.

The dimensions of the formwork shall be measured correct to a centimetre.

No deductions shall be made from the shuttering for openings/obstructions up to an area of 0.10 m2 and

nothing extra shall be paid of forming such opening.

For the purpose of measurements for formwork IS: 1200 (Part V) shall be referred.

14. SPECIFICATION FOR STAGING WORK:

The contractor shall note that only steel tubular staging (acrow type or equivalent) shall be used for all RCC beams, slabs, etc. at all floor levels and the same shall be designed by him and the detailed drawings and the design calculations shall be submitted for the approval of Engineer-in-charge at least two months in advance of the scheduled date of its erection at site. Depending upon the height of the staging, suitable vertical and horizontal cross bracings shall be provided. The contractor shall note that no concreting of floor beams, stairs and slabs including roof slab will be permitted unless the staging work is inspected and approval in writing for its soundness by the Engineer-in-charge is given prior to the commencement of concreting

Providing power cable to Energisers, earthing of energisers, IO connecting etc. is in the scope of supplier.

93. Supply, installation and commissioning of 100 mm GI Perforated tray with cover	**Qty-8000 Mtrs**

1.	Cable tray type	GI cable tray perforated ,Hot**dip**galvanized
2	Thickness of cable tray	2.5 mm
3	Length of cable tray (standard)	2500 mm
4	Dimensions and quantity	100 mm (W) X 50 mm (D)
5	Provision of tying of cable trays together	A pair of Coupler plates must be provided with each set of cable tray
6	Cable trays cover	Must be given of thickness: 1.6 mm Cover for 100 mm(W) cable tray qty 8000mtrs
7	Galvanizing	All cable trays shall be hot dip galvanized. Should the galvanizing of the samples be found defective the entire batch of steel shall be regalvanized at bidder's cost.
8	MOC certifications	Must be supplied along with material
9	Note:	Edges must be smooth. Holes should be burr free
10	Codes for testing and manufacture	IEC61537 or equivalent IS/lSA codes
111	Cable tray supports accessories	1. MS angle support: 50 mm X 50 mm (L-shaped,hot rolled), 5 mm thickness - total according to the cable tray quantity required. 2. Coupler plates must be provided with each cable tray piece
12	Tests reports	1. Bidder must be submit test reports of galvanizing of trays so as to ensure workmanship is of high standards. 2. Bidder must submit material certificate reports for cable trays Bidder must be able to arrange provision forconducting such tests. Purchaser shall haveaccess to such facility where such tests are beingconducted on a sample of cable.

GENERAL REQUIREMENTS:

The perforated cable trays with Tray cover shall be manufactured from good commercial, high grade strength sheet steel having minimum thickness of 1.6mm for Tray and 1mm for Tray Cover.

DESIGN & WORKMANSHIP:

The perforated cable trays shall be hot dip galvanized according to IS-2629, BS-729-1971 or equivalent standard suitable for indoor/outdoor use having moderate humidity and air pollution.

a) The zinc coating thickness shall work out by applying a 610 gm of zinc per square meter surface with an approximate thickness of 80 microns.
b) The zinc coating shall be smooth, clean and uniform thickness and free from defects like ash and dross inclusions, bare patches, black spots, pimples, lumpiness, rust stains, blisters etc.
c) The galvanizing shall not adversely affect the mechanical properties of the coated material
d) All manufacturing process including punching, cutting, bending and welding of perforated cable trays shall be completed and burrs shall be removed before the application of galvanization process is applied.
e) The joints of two trays shall be butt construction and shall be made with the help
    a. of coupler plates by nuts and bolts. The coupler plate and nuts and bolts shallalso be properly hot dip galvanized.

f) The perforated trays shall be free from sharp edges and burns etc. so that joint
   a. between two trays shall be without any clearance and matched in propershape.
g) Coupler plate shall be fitted at each side runner at one end. The coupling plates
h) shall be supplied with bolts, nuts and washers fitted at the other four holes for
i) fixing to adjoining member.
j) Coupling plates shall be deigned to permit longitudinal adjustment up to ±10mm
   a. and skew up to 100

94. Laying and dressing of all cables in cable tray	**Qty-8000 Mtrs**

a) All types of cable used in the system to be laid in a cable tray of 100 *30*0.3 mm over a wall. To protect cables from damages, cable is to be covered by cable tray cover.

b) All cores of the Fiber Optic cable must be terminated with properly tagged/labeled with ferrules.

c) Fiber cable termination using pigtails must be done using fusion splicing method.

d) Fixing up of LIUs in the rack with proper numbering has to be carried out by the bidder.

e) Fiber optic outdoor cable laying must be carried out under proper supervision by the contractor. Any damage to the cable or any equipment during commissioning must be the contractor's responsibility. It would be the contractor's responsibility to replace the equipment/cable with new one in case of damage during execution of work.

f) No slack loops must be allowed external to the fiber panels.

g) All the Fiber components should be of the same make (OEM manufacturer).

h) Each cable must be stripped upon entering the termination panel & individual fiber routed in the terminal panel.

i) Hard soil digging/road cutting has to be carried out making use of Punch through method without disturbing the upper road surface.

j) Each cable must be clearly labeled at the entrance to the termination point.

k) LIU, rack has to be installed in each department with proper clamps & screws.

l) The supplier must be fully responsible for all splices, budget loss, attenuators, appropriate fiber hardware, accessories, and pigtail connections for a fully operational system.

➢ **Applicable standards:**

1. DOT Spec No- G/OFC-02-02 March'99 with latest amendments
2. G/OFC-01/03 Aug 99 with latest amendments.
3. ITU G-652 for the fiber core.
4. UL approved

95. CCTV Fail over server with license	**Qty- 2 Nos.**

Failover Server is a video backup server that records up to 150 IP streams from hosts Systems VMS / Recording Server when any of the following conditions occurs:

(1) when the host System/VMS /Recording Server starts up without monitoring;

(2) when file recycling fails;

(3) when there is an error in the hard drive;

(4) when the connection between host and IP camera fails;

(5) when the host System / VMS / Recording Server fails**.**

S. No	**Item**	**Description of Requirement**

a.	Chassis	2U Rack Mountable
b.	CPU	4 x Intel Xeon Processor Scalable Family Intel Xeon Gold 5217 (8C, 3.00 GHz, TLC: 11 MB, Turbo: 3.40 GHz, 10.4 GT/s, Mem bus: 2,666 MHz, 115 W, AVX Base 2.50 GHz, AVX Turbo 3.00 GHz)
c.	RAM	Minimum 2 nos of 16 GB RAM
d.	HDD OS	2 X 480GB SSD (Minimum)
e.	HDD for Data	8 X 8TB SAS SSD Drives for storage
f.	Controller	Raid Controller 4GB . Storage controller should support Secure encryption/data at rest Encryption
g.	Network Ports	Integrated 1 Gbps Quad network ports
h.	Interfaces	USB 3.0 support Minimum 5 USB Ports
i.	Bus Slots	4 Nos of PCIe 3.0 X8 slots 2 Nos of PCIe 3.0 X16 slots All Full-height, full-length slot
j.	System Security	FIPS 140-2 validation Support for Commercial National Security Algorithms (CNSA) Secure Recovery – recover critical firmware to known good state on detection of compromised firmware Secure erase of NAND/User data UEFI Secure Boot and Secure Start support Common Criteria certification Advanced Encryption Standard (AES) and Triple Data Encryption Standard (3DES) on browser
k.	Power Supply	Hot plug redundant power supplies
l.	Embedded Remote Management and firmware security	1. System remote management should support browser based graphical remote console along with Virtual Power button, remote boot using USB/CD/DVD Drive. It should be capable of offering upgrade of software and patches from a remote client using Media/image/folder; It should support server power capping and historical reporting and should have support for multifactor authentication 2. Server should have dedicated 1Gbps remote management port 3. Server should have storage space earmarked to be used as a repository for firmware, drivers and software components. The components can be organized in to install sets and can be used to rollback/patch faulty firmware 3. Server should support agent less management using the out-of-band remote management port 4. The server should support monitoring and recording changes in the server hardware and system configuration. It assists in diagnosing problems and delivering rapid resolution when system failures occur 5. Applications to access the server remotely using popular handheld devices based on Android or Apple IOS should be available

		6. Remote console sharing upto 6 users simultaneously during pre-OS and OS runtime operation, Console replay - Console Replay captures and stores for replay the console video during a server's last major fault or boot sequence. Microsoft Terminal Services Integration, 128 bit SSL encryption and Secure Shell Version 2 support. Should provide support for AES and 3DES on browser. Should provide remote firmware update functionality. Should provide support for Java free graphical remote console.
m.	Operating System	Windows 2019 servers standard edition or latest licensed OS
n.	DVD Writer	Internal / External DVD writer
o.	Monitor	21.5" Networ rack mountable Monitor with integrated keyboard and mouse
p.	Warranty	3 years onsite warranty

96. Two years comprehensive warranty of all components	**Qty- 1 No**

This means, in addition to the one-year standard warranty, two years additional warranty in the form of comprehensive maintenance work as follows for all the items is also in the scope of the contractor. Moreover the OEM warranty as indicated against individual item is also in the scope of the work.

1. On the successful completion of work (Item no. 1 to 95) and from the issue of completion certificate, the contractor shall deploy a team of technically qualified and experienced manpower (at least one engineer and one technician) for the work (Item no. 96) at BARC site on all working days (Monday to Friday) from 08:00 to 16:30 hrs. for three years (1 year standard warranty and 2 years additional comprehensive warranty).
2. The team shall report at site on call in case of system breakdown even on holidays and off-working hours. The contractor shall ensure regular availability of the team at site and suitable alternative arrangement shall be made in the period of absence of any team members.
3. The contractor shall maintain all above installed items & spares in good working condition by repairing or replacement if required. All the components and tools required for the repair work are in the scope of the contractor.
4. The contractor should make available replacement items to BARC site **within 72 hours** of the Failure or intimation received from EIC.
5. Handling, removal, installation and shifting of the items for carrying out replacement/repair work is also in the scope of the contractor.
6. The deployed team shall coordinate between OEM/System Integrator/Contractor to complete the breakdown and warranty related works as mentioned above.

Working Procedure:

All the work should be done as per the instruction and guidance of the Engineer –in- charge and the decision given by him will be the final. The materials to be fabricated / supplied should be checked by the Engineer –in-charge prior to install.

Safety:

All general safety and electrical safety should be taken care by the contractor. Department will not be responsible for any type of incident occurs due to violation of safety rules and regulations.

Guarantee by the contractor:

(a) The Contractor shall guarantee that the work / goods furnished by him shall be in full accordance with the requirements of the technical specifications and drawings. Contractor provide the guarantee that the goods are new and of high quality and that the goods are free from

defects in design, materials or workmanship as applicable and guarantee shall cover for a period of twelve (12) months from the date of satisfactory handing over the system to the Engineer.

(b) If within the expiry of the above stipulated guarantee period, goods or any part thereof are found defective because of workmanship or materials, contractor shall at his own expense repair or furnish replacement parts of proper workmanship and materials as approved by the Engineer. The guarantee period for replaced parts or repair work shall be same as above.

General Terms and conditions:

a. The contractor is deemed to have visited the site to acquaint with site conditions and all relevant Information required for the satisfactory completion of the work before submitting the tender.
b. The complete job has to be carried out as per instruction of Engineer-in-charge of the work order or his authorized representative.
c. The contractor shall bear entire responsibility, liability and risk related to coverage of his work force under different statutory regulations including workmen's compensation act, factory act, labour act, minimum wage act and other relevant statutory regulations.
d. The contractor shall ensure that all safety precautions are invariably taken to safeguard accidents and injuries to his own workmen. All necessary safety equipment as per the safety regulations and requirements for the job and as directed by the Engineer-in-charge shall be provided by the contractor at his own cost.
e. The contactor shall ensure that no worker with criminal records is employed on the BARC work. If any worker with undesirable antecedents is found to be employed, the contractor shall forthwith remove such worker from the work site. The contractor shall be held fully responsible in the event of any adverse report from the law enforcing authorities. The contractor should submit two passport size photographs of each worker for the security purposes.
f. The work should be completed within stipulated time period.
g. If the work is not completed within the above-mentioned period the liquidation penalty will be charged by the department.
h. After completion of the job the contractor shall formally inform the GM, INRP(O), NRB, Tarapur in writing about the same. The departmental representative will then inspect the executed job. Only after getting satisfied with this inspection, the GM, INRP(O), NRB, Tarapur, will issue the certificate of completion to the contractor.
i. Contract work will be allowed to do as per convenience of getting outage of the system.
j. The work will be carried out in active area having radiation field below 1m R/hr.

Miscellaneous works:-

OTDR Testing

- OTDR testing of all the installed and spliced fiber cable is to be done to determine the losses/break in installed fiber.

Soft Soil Digging with refilling

- Fiber Optic cable to be laid underground in soft soil must be in a trench 1.5 feet X 3 feet deep over a bed of 5 cm river sand for laying of HDPE pipe in same level.
- In case of any difficulties in achieving desired depth, the cable is to be laid as per the direction of site engineer.
- The excavation of trenches must be done straight as far as possible.
- Some places more than one cables may be laid in the same trenches however the supplier should lay the additional cables in the same trenches without increasing the width of the trenches.
- After laying of cable these trenches should be covered properly by the soils.
- For the above jobs, excavation of trenches for laying of pipes and cables in all solids excepting soft and hard rock up to a depth not exceeding 1.2m depth including shoring and dewatering if necessary and refilling in trenches with selected excavated material in layers etc. and disposing of the surplus earth within distance of 50M.

Hard Soil Digging and refilling with PCC

- The G.I pipe should be of 1"dia.
- This G.I pipe should be of minimum of 2-meter length.
- This G.I pipe will be laid wherever there is road crossing.
- The G.I should be of class B.
- In-case of any difficulties in achieving desired depth, the cable is to be laid as per the direction of site engineer.

- For the total length of the road the pipes should be joined by using the pipes fittings.
- The road cutting length will be different for different roads.
- The road cutting should be refilled by using the P.C.C layer of 150 mm with 1:2:4 ratio cement composition, 150 water boned macadam, 230 mm soiling and rest is of soil.
- Refilling of road should be made with 300 mm black soil, 150 mm macadam, 250 mm P.C.C.
- This road cutting should be done in the non-peak hour of the traffic in consultation with the site engineer. It may be planned to do the half road cutting to avoid the total blocking of the road.
- After laying of the G.I pipes and Pulling of fiber the road should be refilled properly.
- After a few days of settling of soils in the road cutting, the cementing work should be done with the composition of cement, sand and gravels in the ratio of 1: 2: 4.

In some places the road cutting length may be little more or less than the specified length of BOM, therefore supplier should inspect the road and quote accordingly.

GOVERNMENT OF INDIA

BHABHA ATOMIC RESEARCH CENTRE

Nuclear Recycle Board, Tarapur

(SECTION – VI)

LIST OF DRAWINGS

(Drawings are available in the office of the Project Manager, TNRPO, NRB which bidders may refer. It will be provided during execution of work after placement of work order.)

GOVERNMENT OF INDIA

BHABHA ATOMIC RESEARCH CENTRE

Nuclear Recycle Board, Tarapur

(SECTION – VII)

PROFORMA OF SCHEDULES

PROFORMA OF SCHEDULES

Name of work: "**Supply, Installation, Testing, Commissioning and Training of CCTV & lighting System**".

Ref: NIT No. - **BARC (T)/NRB/RWM/EI/2022-23/OPA/01** Dated:15/12/2022

SCHEDULE – A - Schedule of Quantities (Enclosed Separately)

SCHEDULE – B – Material to be issued by Department

Sr. No.	Particulars	Unit	Quantity	Rate in Rs.	Availability
1	Water	KL	As required	Free of cost	Single supply point near work site
2	Electricity	kWh	As required	Free of cost	Single power point near work site

Notes:

1) All the items of Schedule-B will be accounted on monthly basis.

2) Services to be rendered by the department are not mandatory; delay caused on this account shall not be taken as reason for extension of contract period.

3) All materials used for power distribution shall be offered for inspection / approval, if asked by NRB, BARC and shall be changed / replaced by Contractor, if deemed necessary by NRB, BARC.

SCHEDULE – C: NOT APPLICABLE
Tools and plants to be hired to the contractor

SCHEDULE – D: YES APPLICABLE
Contractor should commission the supplied items, as per the requirement which is mentioned below.

a. Integration of existing Electric security fencing with CCTV software and implementation of intrusion detection and alarm system based on electric fencing.

b. Implementation of Intrusion detection and alarm system, based on CCTV camera Video Analytics.

c. Implementation of IP Based Intrusion alarm announcement system and interfacing with CCTV and electric fence based intrusion detection system.

d. Two years comprehensive warranty of all components as per item no. 96 in the BOQPPP

SCHEDULE – E

Name of work	:"**Supply, Installation, Testing, Commissioning and Training of CCTV & lighting System**".
NIT cost of work	: Rs 8,0000000 (Rupees Eight Crore only)
Earnest Money	: Rs.16, 00000 (Rupees Sixteen Lakhs only)
Performance Guarantee	: 3% of tendered value
Security Deposit	: 2.5% of tendered value

SCHEDULE – F

Reference to General Conditions of Contract

GENERAL RULES & DIRECTIONS

Officer inviting tender : **GM, R&WM, INRP(O), NRB, BARC, Tarapur**.

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: See below

Definitions:

2(e) Engineer-in-Charge : As intimated in the Work Order

2(g) Accepting Authority **: GM, R&WM, INRP(O), NRB, BARC** , Tarapur

2(i) Percentage on cost of materials and Labour to cover all overheads and profits: 15%

2(k) Standard Schedule of Rates : Barc schedule of rates-2015

2(l) Department : Nuclear Recycle Board, BARC, Tarapur, DAE

Clause 1

(i) Time allowed for submission of Performance Guarantee: 15 days from the date of issue of work order or before commencement of work whichever is earlier.

(ii) Maximum allowable extension with late fee @0.1% per day, of Performance Guarantee amount beyond the period provided in (i) above: in days with the approval of competent authority :7 to 15 days on submission of written request.

If contractor fails to furnish the prescribed Performance Guarantee within the prescribed period, the Government shall without prejudice to any right or remedy, be at liberty to forfeit the Earnest Money absolutely.

Clause 2

Authority for fixing compensation under Clause-2: **GM, R&WM, INRP(O), NRB, BARC, Tarapur**

Clause 2A: Not applicable

Clause 5

i. Number of days from the date of issue of work: 15th day from the date of issue of work order order for reckoning date of start or actual date of start of work whichever is earlier.

ii. Time allowed for completion of work: **12(Twelve) Calendar months including Monsoon Period**

Table of Mile Stone(s) If applicable

Sl. No.	Description of Milestone (Physical)	Time allowed in days (from date of start)	Amount to be withheld in case of non achievement of milestone
1	1/8th (of whole work)	1/4th (of whole work)	In case of non achievement of milestone, 1% of the tendered value of work will be withheld for failure of each milestone.
2	3/8th (of whole work)	1/2th (of whole work)	
3	3/4th (of whole work)	3/4th (of whole work)	
4	Full	Full	

Authority to decide:

(i) Extension of time: **GM, R&WM, INRP(O), NRB, BARC, Tarapur**

(ii) Rescheduling of mile stone : **GM, R&WM, INRP(O), NRB, BARC, Tarapur**

(iii) Shifting of date of start in case of delay in handing over of site: Maximum allowable

2 months from the date of issue of work order with approval of GM, R&WM, INRP(O), NRB,BARC, Tarapur

Clause 6, 6A - Clause applicable: 6A

Clause 7

Gross work to be done together with net payment / adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment: Rs. 0/-. (Rupees Zero)

Clause 10A

List of testing equipments to be provided by the contractor at site lab:

a. Multimeter
b. LAN Tester
c. OTDR
d. View Finder
e. Splicing Machine

Clause 10 B : Not Applicable

Clause 10 C : Not Applicable

Clause 10 CA : Not Applicable

Sl. No	Materials covered under this clause	Nearest Materials for which All India Wholesale Price Index to be followed	Base Price of all the Materials covered
1	Cement	Ordinary Portland cement	Rs. ……./MT
2	TMT Bars	MS wire rods	Rs. ……./MT
3	Structural Steel	Steel Flats	Rs. ……./MT

Clause 10 CC : Not Applicable

Clause 10CC will be applicable in contracts where the stipulated period for completion is more than 12 months.

Schedule of component for price escalation	Percentage
Component of Labour Expressed as percent of total value of work	
Component of materials (except material covered under Clause 10CA) expressed as percent of total value of work	

Clause 11

Specifications to be followed for execution of work: BARC Specifications, Drawings, Indian Standards and Special Publication as per technical specifications.

Clause 12

12.2 & 12.3	Deviation Limit beyond which clauses 12.2 & 12.3 shall apply for building work	30% for superstructure
12.2 & 12.3	Deviation Limit beyond which clauses 12.2 & 12.3 shall apply for maintenance work	50% for maintenance
12.5	Deviation Limit beyond which clauses 12.2 & 12.3 shall apply for foundation work	100% for substructure

Clause 16

Competent Authority for deciding reduced rates: **GM, R&WM, INRP(O), NRB, BARC, Tarapur**

Clause 18

Suggestive List of Machinery, Tools & Plants to be deployed by the Contractor at site:-

1. Multimeter
2. Tester
3. OTDR
4. View Finder
5. Splicing Machine

Clause 25: As per GCC

Clause 36(i)- Not applicable

Requirement of Technical Representative(s) and recovery rate

Sr. No.	Minimum Qualification	No.	Minimum experience	Discipline	Designation	Rate at which recovery shall be made from the contractor in the event of not fulfilling provision of clause 36(i)
1	Graduate Engineer	--	-----	-----	-----	Rs…../ Month
2	Graduate/Diploma Engineer	---	----	---	-----	Rs…../ Month

Clause 42: **Not Applicable**

(I) (a)	Schedule/statement for determining theoretical quantity of cement & bitumen:	Specification of the work

(II) Variations permissible on theoretical quantities

(a) Cement : 2.0% plus/minus

(b) Bitumen All Works : 2.5% plus side only & nil on minus side.

(c) Steel Reinforcement and structural steel sections for each diameter, section and category : 2 % plus /Minus

(d) All other materials. : Nil

Recovery rates for quantities beyond permissible variation

Sl. No	Description	Recovery rate for Excess beyond permissible variation	Recovery rate for Less use beyond permissible variation
A	Supplied by Contractor		
1	Cement	NA	--------/ MT
2	Steel Reinforcement and	NA	---------/MT
3	Structural Steels	NA	----------/MT

Sd/-

GM, R&WM, INRP(O)
NRB, BARC, Tarapur
(For and on behalf of President of India)

GOVERNMENT OF INDIA

BHABHA ATOMIC RESEARCH CENTRE

Nuclear Recycle Board, Tarapur

(SECTION – VIII)

SCHEDULE – A –

Schedule of Quantities and Rates

Schedule-A

Schedule of Quantities and rates

Ref. No: **BARC (T)/NRB/RWM/EI/2022-23/OPA/01**

Name of Work: - "Supply, Installation, Testing, Commissioning and Training of CCTV & lighting System".

Sr. no	Item description	Qty	Unit	RATE (With Tax) In Figures	TOTAL AMOUNT (With Tax) in Rs.	TOTAL AMOUNT (With Tax) In Words
1	Supply of IP (POE) based pole mountable camera with accessories.	117	Nos			
2	Installation, testing & commissioning of Item no.1	97	Nos			
3	Supply of IP (POE+) based Day & Night HD PTZ camera, with pole/wall mountable accessories.	20	Nos			
4	Installation, testing & commissioning of Item no. 3	15	Nos			
5	Supply of Indoor Dome Camera with mounting accessories.	12	Nos			
6	Installation, testing & commissioning of Item No-5	10	Nos			
7	Supply of Digital Input output module for integration of proposed IP CCTV and exiting Electric Fence system.	15	Nos			
8	Installation, testing & commissioning of Item No-7	10	Nos			
9	Supply of Fish Eye Camera	5	Nos			
10	Installation, testing & commissioning of Item No 9	3	Nos			
11	Supply of Number Plate Reading camera and software.	3	Nos			

12	Installation, testing & commissioning of Item No -11	2	Nos			
13	Supply of servers	2	Nos			
14	Installation, testing & commissioning of Item No-13	2	Nos			
15	Supply Video Management software including 150 channel license and Video recording software.	1	Lot			
16	Installation, testing & commissioning of Item No-15	1	Lot			
17	Supply of Work station computer	10	Nos			
18	Installation, testing & commissioning of item No 17	10	Nos			
19	Supply of Layer-2 Network switch-24 Giga port Combo managed.	3	Nos			
20	Installation, testing & commissioning of Item No 19	3	Nos			
21	Supply & Installation of 8 TB Surveillance hard disks compatible with above Server.	12	Nos			
22	Supply of Network switch-12 port, POE+managed Layer 2 with two SFP ports.	30	Nos			
23	Installation, testing & commissioning of item no 22	25	Nos			
24	Supply of 12 port fully loaded LIU	26	Nos			
25	Installation and commissioning of Item No 24	25	Nos			
26	Supply of 12 Port UTP patch panel	26	Nos			
27	Installation and commissioning of Item No 26	25	Nos			

28	Supply of 24 Port LIU	5	Nos			
29	Installation and commissioning of Item No 28	4	Nos			
30	Supply, Installation & commissioning of 5 Mtr CAT6 Shielded Patch Cord	150	Nos			
31	Supply, Installation and commissioning of 2 Mtr CAT6 Shielded Patch Cord	100	Nos			
32	Supply of Bi-Di SFP module in Pairs	100	Nos			
33	Installation and commissioning of Item No 32	48	Nos			
34	Supply, Installation and commissioning of suitable fiber Patch cords	200	Nos			
35	Supply, Installation and commissioning of Surge protecting devices for data lines (LAN)with Metal Body	240	Nos			
36	Supply, Installation and commissioning of Surge protecting devices for power	50	Nos			
37	Supply of 55" Display Monitors along with wall mount unit	10	Nos			
38	Installation and commissioning of Item No 37	9	Nos			
39	Supply of Hot dip Galvanized Pole of 1.5 mtrs for installing the PTZ cameras including mounting accessories, and fixing structure.	11	Nos			
40	Installation and commissioning of Item No 39	11	Nos			
41	Supply of 9U rack for terminations in the field with IP-54 or better compliance	22	Nos			
42	Installation & commissioning of Item	22	Nos			

	no 41					
43	Supply of 12U rack for terminations in the field with IP-54 or better compliance	2	Nos			
44	Installation & commissioning of Item no 43	2	Nos			
45	Supply of 42U x 19" standard rack for network components and CCTV servers, network switch and PDB etc.	1	No			
46	Installation &commissioning of Item no 45	1	No			
47	Supply of 6core 9/125 micron SM fiber optic armoured cable	8000	Mtrs			
48	Supply of STP Armored shielded cat6e cable (roll of 305 Mtrs)	3050	Mtrs			
49	Supply of CCTV Power Cable 2.5 sq. mm	8000	Mtrs			
50	Supply, Installation & commissioning of 1" HDPE Pipe	1000	Mtrs			
51	Splicing of fiber core and terminations	500	Nos			
52	Supply, Installation and commissioning of JB with DIN rail for installation of SPDs	70	Nos			
53	Supply of Step Type-Ladder	1	Nos			
54	Supply of Self Supported Cum Extension Ladder	1	Nos			
55	Supply of Battery Operated Vehicle for Maintenance of the CCTV system	1	Nos			
56	Supply, Installation and commissioning of PVC Conduit flexible 25mm	500	Mtrs			
57	Supply, Installation and commissioning of PDB's	2	Nos			

58	Supply Installation and commissioning of MCB's	50	Nos			
59	Supply of Network switch-12 port, POE+ managed Layer 2 with four SFP ports	4	Nos			
60	Supply of IP Based Horn Speakers	30	Nos			
61	Installation and Commissioning of Items No 63	24	Nos			
62	Supply & installation and commissioning of SIP Mike	2	Nos			
63	Supply of 6mtr high Hot Dip Galvanized HR Steel Sheet (3 mm thick) Octagonal street light pole having bottom of 130 mm A/F, top 70 mm A/F including provision for mounting of camera at 5 mtrs and double arm bracket for fixing of two nos of 40W LED fixtures at a height of 6 mtrs with Foundation Bolt Sets (Each set contains 4 numbers of foundation bolts), Double Arm Bracket of arm length 1mtr for LED lights and double arm bracket of arm length 1 mtr. for camera mounting.	60	No			
64	Installation and commissioning of item no 63	60	No			
65	Supply of Suitable size FRP termination box. Each FRP box Shall have 10A MCB for each fixture and 4 nos. of FRP base connector for the cable termination for 25 Sq.mm Cu cable.	60	No			
66	Installation and commissioning of item no 65	60	No			
67	Supply of outdoor type, free standing, floor mounted, double door with locking arrangement Feeder pillar suitable for 415 V, 3	2	No			

	phase, 4 wire, 50Hz, fabricated out of Pregalvanized G. I sheet steel duly compartmentalized, powder coated, dust and vermin proof (IP-54) with one no. 125 A incomer MCCB , bus bar as required, Astronomical analog time switch: 1 No., Voltmeter with selector switch, Ammeter with selector switch, CT, Indication lamps, protective fuses, danger notice plate etc as required, 2 outgoing loops from feeder pillar. Each outgoing loop has 1 No. of 63 A TPN SFU, 1 No. of 63A TPN MCCB, 1 No. of 63 A TPN ELCB and 1 No. of 63 A TPN power contactor. Feeder pillar should be supplied with its base frame.					
68	Installation and commissioning of item no 67	2	No			
69	Supply of LED street light fitting of 40w having System Efficacy of 115 lm/W, system output of 4700 lumens, THD <10%, Power Factor >0.95, CRI >70, CCT 5700K, Full IP 66 protected single piece die cast aluminium housing having PC with Impact resistance IK08, Life L70B50 @ 50k hrs. LED driver should be Potted & Encapsulated. BIS compliant driver should sustain 440V Stress Voltage protection for 8 Hrs., High Cut off : 325V(+/- 15V) and should have feature of Auto Restart, EMC -EMI compliant. Driver shall have 4KV Surge protection and feasibility of 10KV external SPD housed in Luminiare. Similar to Philips Cat no:BRP056 LED47 CW SLF PSU S1.	120	No			
69.1	Installation and commissioning of item no 69	120	No			

70	**Supply of Power cable**					
70.1	Power cable (2XWY (P)) of size 4C x 25Sq.mm, Annealed copper conductor, Multistranded, round wire Armoured, XLPE insulated, cores laid up with HR PVC type inner sheath and outer sheath ZHLS of extruded PVC type ST2(P) and ST2(Y), of 1.1 kV grade as per IS 7098 (part - 1) 1988. B)	5000	mtr			
70.2	Power cable (2XWY (P)) of size 3.5C x 50 Sq.mm, Annealed copper conductor, Multistranded, round wire Armoured, XLPE insulated, cores laid up with HR PVC type inner sheath and outer sheath ZHLS of extruded PVC type ST2(P) and ST2(Y), of 1.1 kV grade as per IS 7098 (part - 1) 1988.	3000	mtr			
70.3	3C x 1.5 Sq.mm Unarmoured Copper Flexible cable	2000	mtr			
71	**Underground Laying and Dressing of Power cables upto working voltage 1.1 kV as per IS 1255 - 1983.**					
71.1	Power cable (2XWY (P)) of size 4C x 25 Sq.mm, Annealed copper conductor, Multistranded, round wire Armoured, XLPE insulated, cores laid up with HR PVC type inner sheath and outer sheath ZHLS of extruded PVC type ST2(P) and ST2(Y), of 1.1 kV grade as per IS 7098 (part - 1) 1988.	500	mtr			
71.2	Power cable (2XWY (P)) of size 3.5C x 50 Sq.mm, Annealed copper conductor, Multistranded, round wire Armoured, XLPE insulated, cores laid up with HR PVC type inner sheath and outer sheath ZHLS of extruded PVC type ST2(P) and ST2(Y), of 1.1 kV grade as per IS 7098	300	mtr			

	(part - 1) 1988.					
71.3	3C x 1.5 Sq.mm Unarmored Copper Flexible cable	200	mtr			
72	**Supply of weather proof, Brass, double compression type cable glands suitable for cable of following sizes.**					
72.1	4C x 25 Sq.mm, Multistranded, round wire armoured, XLPE insulated, Copper conductor	10	No			
72.2	3.5C x 50 Sq.mm, Multistranded, round wire armoured, XLPE insulated, Copper conductor	6	No			
73	**Supply of Copper Lugs suitable for cable/ conductor of following sizes**					
73.1	3.5C x 50 Sq.mm, copper, Ring type	20	No			
73.2	4C x 25 Sq.mm, copper, Ring type	1200	No			
73.3	3C x 1.5 Sq.mm, copper, Ring type	1000	No			
73.4	3C x 1.5 Sq.mm, copper, Pin type	1000	No			
74	**Glanding and End Termination of power cable of following sizes**					
74.1	3.5C x 50 Sq.mm, copper	10	No			
74.2	4C x 25 Sq.mm, copper	300	No			
74.3	3C x 1.5 Sq.mm, copper	500	No			
75	Excavation in all type of soils of width as specified in the technical specifications as per the size and the no of runs and a depth of 1500 mm below ground level, crushed sand bedding, Laying of baked bricks on side and top, back filling, dewatering, consolidation shoring, disposal of excess earth. Item includes supply of crushed sand sand	200	Cu. Mtr			

	and class - I bricks.					
76	Providing, laying and fixing 250 mm dia RCC pipe NP2 class(light duty) inclusive of road cutting of width 800mm and depth 1000 mm complete with RCC collars, jointing with cement mortar 1:2(1 cement: 2 fine sand), 100mm thick encasing the pipe with concrete of 1:2:4 grade, backfilling and concreting (1:2:4) with M30 grade of 200mm thick and as per the attached drawing.	75	mtr			
77	Supply, Fabrication and Installation of Standard steel sections Hot dip galvanized as per grade B0 for cable support and chamber over. Fabrication shall include drilling, entitling, welding, wire brush cleaning, supply of all consumables like gas, welding rods.	2	Ton.			
78	Supply and Assembling of Fibre glass reinforced Plastic mobile telescopic ladder with Type IA duty rating of height 25 feet as per the attached technical specification	4	No.			
79	Supply and embeddment of 40 mm dia. G.I. pipe (medium class) in pole foundation (during casting) separately for cable entry and cable exit including bending the pipe to the required shape complete as required	400	mtr			
80	Supply of 8 SWG stranded, flexible G.I wire for street light pole earthing.	1200	mtr			
81	Laying of 8 SWG stranded, flexible G.I wire in 25mm dia G.I. pipe electrode buried in ground at minimum depth of 1000mm for street light pole earthing including end connection, excavation and re-	1200	mtr			

	filling etc as per instructions by Engineer-In-Charge.					
82	Supply, Installation and Commissioning of Copper Earth Plate 600 mm x 600 mm x 3 mm thick of high grade quality including accessories and providing PCC enclosure with Chequered cover plate hot dip galvanised having lifting lug and locking arrangement and watering pipe of 2.7 metre length with charcoal / coke and salt as per IS 3043 standard, technical specification and drawing.	4	No			
83	Supply and embeddment of 25 mm dia. G.I. pipe electrode (medium class) for individual pole earthing	700	mtrs			
84	Providing and fixing Rough Shahbad Stone of minimum 50 mm average thickness of size 600 X 600 mm (Approximate) over 150 mm thick (consolidated thickness) stone dust backing including setting in position in footpath to the required level and line Pointing with C.M 1:4 (using crushed sand). Joint shall be 20 to 25 mm wide including filling of joints with cement mortar and making grooves etc. complete as per the direction of Engineer-incharge	500	Sq. mtr			
85	Removal of Rough Shahbad Stone of minimum 50 mm average thickness of size 600 X 600 mm (Approximate) over 150 mm thick (consolidated thickness) stone dust backing as per the instruction of EIC.	500	Sq. mtr			
86	Earth Work excavation by mechanical means (Hydraulic excavatior) / manual means in all types of soil & soft rock. Dressing the sides of foundation, ramming of foundations etc. Including shoring	250	Cu. Meter			

	and dewatering (if necessary) and refilling with selected excavated earth in layers of not more than 500 mm thick, each layer well rammed and consolidated including disposing the surplus earth within a distance of 200 m all as per specifications and as directed by the Engineer-in-charge.					
87	Murum Filling under floors of specified thick in layers of not more than 150 mm thick including supplying required materials and consolidation etc. complete (Murum to be brought from out side campus of BARC).	10	Cu. mtr			
88	Supplying, Stacking and Laying of 230 mm Thick rubble Soling stones as under Floor base including packing with smaller stone and compacting, ramming including spreading and consolidation of blinding material, moorum etc. Complete all as per specifications and as directed by the Engineer-in- charge.	50	Sq. mtr			
89	Providing and laying in position cement concrete of 1:2:4 (1 cement, 2 crushed sand, 4 graded stone aggregate of nominal size 20 mm) including consolidation, finishing curing etc. complete as per specification and drawings, but excluding the cost of form work shuttering, centering and steel reinforcement Up to PLINTH LEVEL complete.	30	Cu. mtr			
90	Providing and laying in position Reinforced Cement concrete (RCC) OF Grade M-30 using 20mm maximum size aggregates and crushed sand of approved quality including Admixtures of	25	Cu. mtr			

	approved Brand and quality (Plasticizer or super plasticizer) if required, including weigh batching, Mechanical mixing, transporting, placing, vibrating, consolidation, finishing, curing etc. Complete but excluding the cost of centering, shuttering, and reinforcement complete as per specification up to Plinth Level (Cement Concrete M-30 Grade nominal size 20 mm metal.					
91	Providing Reinforcement steel for reinforced cement concrete at all levels including supplying, preparation of bar bending schedules, cutting, bending, transporting, fixing, tieing in position with 1.6 mm dia soft drawn annealed binding wire all labour charges, cost of cover blocks in specified grade of concrete etc. complete including cost of binding wire as per specifications and drawings. Using TMT Bars of specified Grades of all Sizes. TMT bars to be supplied by the contractor SAIL, RINL, JSW or TATA make only. Steel Supplied by the Contractor	1	MT			
92	Providing, centering, shuttering Form work by using steel plates, timber planks for all types of structures including necessary strurtting, proping, staging, supports etc and deshuttering the same after the specified time all as per drawings and specifications at all levels.	200	Sq. mtr			
93	Supply installation and commissioning of 100 mm * 50 mm GI Perforated tray	8000	Mtrs			
94	Laying and dressing of all cables in cable tray	8000	Mtrs			

95	CCTV Fail over server with license	2	No.			
96	Two years comprehensive warranty of all components	1	No			
Total						
Total (Rupees in words: ----------)						

Name of the Contractor/Firm
Signature with seal

Sd/-

GM (R&WM), INRP(O)
NRB, BARC, Tarapur
(For and on behalf of President of India)

* Detailed description of work of each Task is defined in Annexure-A of tender document.

Declaration:

1. We hereby confirm that the rates quoted shall remain firm throughout the term of the contract.
2. We hereby confirm that the rates quoted include all applicable taxes and duties.
3. We confirm that we have clearly understood the scope of work and technical specifications.
4. We confirm that the above rates include cost of transportation, labour etc.

GENERAL INSTRUCTIONS

1. The Schedule of quantities is to be read for pricing in conjunction with the special instructions to tenderer, general rules for guidance of tenderer, conditions of contract and scope of work.

2. The prices quoted in the schedule of quantities shall be the all inclusive value of the work described including all costs and expenses which may be required in and for the construction of the work described together with all general risks, liabilities and obligations set forth or implied in the documents on which the tender is to be based.

3. The quantities stated are to be considered approximate only and the unit prices entered in the schedule of quantities shall apply only to the actual quantities measured in the completed work in accordance with the specifications.

4. All tools, machinery, labour and materials required for satisfactory execution of the work under this contract are to be supplied by the contractor and his rates shall include for the same.

5. All the materials other than shown in Schedule 'A' required for the job are to be arranged by the contractor and its rates shall be account for the same.

6. The contractor shall fill his rates in the Schedule of Quantities and Rates in both figures and words and he shall also workout the amounts for the quantities against the items in the schedule.

7. The prices quoted shall include all taxes and duties, charges of transportation, insurance and other charges not mentioned above but is the part of work.