



**NATIONAL INSTITUTE OF TECHNOLOGY  
ROURKELA-769008 (ODISHA)**

**Tender Notice No: ET-37/2012-13.**

Sealed proposals are invited for Electrical Wiring of New Extension Block of Mining and Ceramic 3 storey Building under new construction.

Issue of tender(Website) : **14.01.2013 to 31.01.2013**

Closing Date & Time : **31.01.2013 by 3.00 p.m**

**Open on 31.01.2013 at 3.30 PM**

for details, visit [www.nitrkl.ac.in/tender.asp](http://www.nitrkl.ac.in/tender.asp)

**Contact:** Prof. S.Mohanty, PIC (Electrical Construction).

**Phone no:** 0661-2462405,

**Email :** s.mohanty@nitrkl.ac.in

**S/d  
Registrar**

*An Institute where everyone strives to attain his Potential.*



**NATIONAL INSTITUTE OF TECHNOLOGY  
ROURKELA-769008, ODISHA  
(SHORT NOTICE TENDER NO: ET-37/2012-13)  
(electrical wiring of extension block of mining and ceramic buildings  
in nit, rourkela)**

Sealed tenders are invited from reputed Contractors of Class-I/Special Class having valid registration with PWD (Orissa State) / CPWD / PSUs and Valid Electrical License with State of Orissa having sound financial status, machinery, resources and experience in execution of similar works.

<u>Name of Work</u>	<u>Estimated Cost(Approx)</u>	<u>Earnest Money Deposit</u>	<u>Time of Completion</u>
Electrical Wiring of New Extension Block of Mining and Ceramic 3 storey Building under new construction	Rs. 55,00,000.00	Rs. 55,000.00	14 months In closed coordination With Civil Work

1. The contractors who fulfill the following requirements shall be eligible to apply. Joint ventures are not accepted.
    - i) Should have successfully completed similar works during the last seven years ending 31<sup>st</sup> March 2012, as a prime contractor satisfying either of the following:-
      - a) Three similar completed works each costing not less than Rs. 22 Lakhs

**or**

    - b) Two similar completed works each costing not less than Rs. 27 Lakhs

**or**

  - c) One similar completed work costing not less than Rs. 44 Lakhs
- Similar work shall mean Electrical wiring of at least two storey buildings . Preference will be given to firms who have done similar works in educational and research institutions of repute.
- ii) Should have had average annual financial turnover (out of work of similar nature) of Rs. 45 Lakhs on construction works of similar nature during last 3 years, ending 31 March 2012 (Copy of Certificate from CA to be submitted)
  - iii) Should not have incurred any loss in more than two years during the last five years. Solvency Certificate from bankers to be submitted.
- iv) A duly constituted committee based on the information to be submitted by agency, will assess the capacity of the construction agency to take up the new project under consideration to complete in time.
2. Sealed tenders on overall cost plus/minus percentage basis, are invited in the prescribed form for execution of, internal electrification, external electrification.

- (a) The Earnest Money may be deposited in the form of Demand Draft of a Nationalized Bank (Payable at Rourkela in favour of Director, National Institute of Technology, Rourkela) along with bank guarantee of any nationalized bank wherever applicable.

A part of earnest money is acceptable in the form of bank guarantee also. In such case, Rs. 2Lakhs will have to be deposited in the shape of Demand Draft and balance in shape of Bank Guarantee of any Nationalised bank having branch at Rourkela. The intending bidder has to fill all the details such as Banker's name, Demand Draft, Bank Guarantee number, amount and date. The Bank Guarantee submitted as a part of Earnest Money shall be valid for a period of six months or more from the date of submission of the tender.

- (b) **Validity of Tender** :- **90 days (from the date of tender opening)**  
(c) **Date of downloading of Tender:-** **From 14.01.2013 to 31-01-2013.**  
(d) **Pre-bid Conference** :- **28.01.2013 at 10-30 A.M in Board Room.**  
(e) **Last date of Submission** :- **31.01.2013 up to 03.00 PM**  
(f) **Date & Time Opening of Tender:-** **31.01.2013 at 3.30 P.M**

3. Questionnaire to tenders is given in the Annexure-I
4. A Pre-bid conference will be held in the Board Room, NIT, Rourkela as per Schedule given above for clarifying issues and clearing doubts, if any, about the specification & other allied technical details. The prospective bidders may attend the pre-bid conference at the appointed date, time and place.
5. The tender papers may be downloaded from NIT website (i.e. [www.nitrkl.ac.in](http://www.nitrkl.ac.in)).
6. The submission of bids by the tenderer should be addressed to the Registrar, National Institute of Technology, Rourkela in three separate sealed Envelopes enclosed in one cover envelope superscribing on the top of the envelope:

**Electrical Wiring of New Extension block of Mining and Ceramic Building**

**IN NIT, ROURKELA**

**(TENDER NOTICE NO: ET-37/2012-13)**

**DUE DATE: 31.01.2013 UP TO 3.00 PM**

**Envelope No-I:** - To contain Bank Drafts and Bank Guarantee towards: (i) Earnest Money deposit. (Note : Exemption claimed if any, against valid registration for similar work in National Small Scale Industries Corporation should be supported with proper and complete documents to qualify for the tender, or else no claim for EMD exemption will be permissible )

**Envelope No-II:**-To contain techno commercial bids including reply to Questionnaire/additional information.

**Envelope No-III:**-To contain the price bid in the prescribed form with overall percentage (in Figures and words) over the total estimated cost which will be applicable to individual schedule

rates for all the electrical work etc. of each work, signed and stamped on all pages of Tender documents.

**NOTE:**

- a) Tenderers are advised not to make any alteration /modification in the Tender documents, item of work or any respect whatsoever. Violation of this requirement will make the tender liable for rejection.
- b) In case schedule date becomes a holiday of NIT Rourkela, the next working date shall be the schedule date.
- c) **Envelope-I** : Consisting of EMD & Tender Document Price will be opened first on the due date of opening.
- d) **Envelope-II** : Will be opened subsequently on fulfillment of submission of EMD and Tender Document Price on the same day.
- e) **Envelope No.- III**: On satisfying the eligibility criteria and that the tender who have confirmed the acceptance of NIT terms and conditions (both technical and commercial), the Envelope No-III(i.e. Price Bid) will be opened.

7.The tenderer must use only the tender forms issued for the purpose.

8.Overwriting of figures is not permitted. Failure to comply with either of these conditions will render the tender invalid and it will be discretion of National Institute of Technology, Rourkela to accept or reject the tender. No request of any change in rate or condition after opening of tender will be entertained.

9. Each page of the tender documents ( after taking out a print ) should be signed by the authorized person or persons submitting the tender as token of his/their having acquainted himself/themselves with the general and special condition of contract, specifications etc as laid down. Any tender with any of the documents not so signed will be subjected to rejection.

10. The tender submitted on behalf of the firm shall be signed by all the partners of the firm or by a partner who has necessary authority on behalf of the firm to enter into the proposed contract, otherwise the tender may be rejected.

11. No consideration will be given to a tender received after the time stipulated above and no extension will be allowed for submission of tender.

12.The NIT-Rourkela shall have the right to reject any tender not conforming to prescribed procedure (or all tenders) without assigning any reason.

13. The time allowed for completion of the work is 24 months or less (including monsoon period) in closed co ordination with ongoing civil work for construction and the date of commencement of the work is reckoned from the date of Letter of Intent/Work Order. Time shall be considered the essence of the contract.

14. The rate quoted shall be firm throughout the tenure of the contract(including extension of time, if any, granted on request of the contractor) and will not be subject to any fluctuation due to increase in cost of materials,labour,sales tax,octroi etc,unless specifically provided in the documents variation clause enclosed in the tender.
15. Water and electricity required for the completion of the construction shall be provided by the institute free of cost. However, the contractor will have to make arrangement of pipe line for water and electric poles, wires, cable etc .for electricity.
16. The Earnest Money will be retained in case of the successful tenderer as a part of the security for due fulfillment of the Contract. No interest shall be paid on this deposit. Failure to enter into the contract agreement within the stipulated time of 20days from the date of letter of Intent shall entail the forfeiture of the Earnest Money Deposit. The Earnest Money of unsuccessful tenderers will be released after issue of work order, without any interest.
17. The tenderer shall submit his tender after carefully examining the whole of the tender document and the terms and conditions of contract, the drawing and specifications, the schedule of quantities etc. and also after examining the site and conditions prevailing in and around site.
- 18.This notice inviting tenders, the conditions of tender and the duly completed form of tender etc. will form part of the Agreement to be executed by the successful tenderer with the Owner.
19. The competent authority on behalf of National Institute of Technology, Rourkela does not bind himself to accept the lowest or any other tender, and reserves to himself the authority to reject any or all of the tenders received without the assignment of a reason. All tenders, in which any of the prescribed conditions is not fulfilled or any condition including that of conditional rebate is put forth by the tenderer, shall be summarily rejected.
20. Tenders shall remain valid for a period of 90 days from the date of opening of the tender which period may be extended by mutual agreement and the tenderer shall not cancel or withdraw the tender during the initial validity period 90 days .
21. Tenderers must include in their rates, sales tax including VAT, excise duty, octroi, and sales tax on works contract and any other tax & duty or other levy by the central and state government or any other tax & duty or other levy or to be levied in future by the central government or state government or local authority if applicable **except Service tax**. No claim in respect of sales tax, excise duty,**service tax**, octroi, turn-over tax, sales tax on works contract or other tax, duty or levy etc. shall be accepted by the Owner, if found later on to be additionally payable. Deductions in respect of sales tax or turnover levied as per government notification and /or guidelines shall be made from the contractor's interim and final bills, and deposited with the relevant authority by the Owner, on his behalf. Any shortfall in deposit thereof shall be made up by the contractor, before submitting his final bill.
22. The Contractor has to pay building and other construction workers welfare cess @ 1% on the cost incurred on the construction work under BOCW (RE & CS) Act 1996.

23. The Contractor shall conform in all respects with the provision of any such Statute, Ordinance or Law as aforesaid and the rules, Regulations or Bye-Laws of any local or other duly constituted authority which may be applicable to the Works.
24. The Contractor shall comply with all rules framed from time to time by Government (Central or State) or other local authority and legislations governing labour for the protection or health, sanitary arrangements, wages, welfare (including EPF, ESI etc.) and safety of workers.
25. This contract shall be an item rate contract. The contractor shall be paid for actual quantity of work done, as measured at site including any deviation plus or minus. The rate of any non-schedule items (i.e. extra item) shall be derived as per conditions of this contract.
26. The tender drawings exhibited/enclosed are preliminary drawings intended for the guidance of the Contractor only. They may be subject to revision and alteration without vitiating any of the terms of the contract and the contractor shall be bound to execute the works as shown on the final drawings without claiming any extra payment.
27. No correspondence will be entertained in respect of this tender other than any clarification strictly pertaining to this tender.
28. All the correspondence and documents shall be in English only.
29. The tender price quoted by a tenderer shall be kept strictly confidential by them and shall not be divulged to any other party even approximately before the time limit for delivery of tender. The only exception be for obtaining an insurance quotation, you may give your insurance company or agent any essential information they ask for, so long as it is done in strict confidence. No information about others tender price should be obtained and no arrangement with anyone else should be made whether or not he submitted the tender.
30. **For electrical works, tenderer must possess or obtain necessary license from the competent authority valid in Rourkela, wherever applicable.**
31. For some items, unit quantity has been indicated in the BOQ for various buildings which may be executed if found necessary. No claim however will be entertained for any variation or deletion.
32. List of approved Makes / Brands / Agencies is enclosed. However the final choice of brand will be as per the decision of the engineer incharge.
33. In case of any variation of rate for similar non schedule items for various buildings, the lowest indicated rate shall be followed.
34. Any clarification required by tenderer may be informed positively by 25.01.13 which will be clarified during Prebid meeting.
35. Tenderers are requested to be present at the time of opening of the bids for discussions, if any.
36. Details including our prescribed format for prequalification, BOQ, General Conditions and Special Conditions of Contracts etc. are available in our website at <http://www.nitrkl.ac.in/tender.asp>.

**REGISTRAR**

**National Institute of Technology**

**Rourkela-769008 (Orissa)**

**Fax: 0661-2472022**

**Ph No: 0661-2472021**

**Copy to:** 1. Director } For kind information  
2. Dean (PD) }  
3. Prof S,MOHANTY, PIC (ET)  
4. Prof. S. K. Das, PIC (CT)  
5. Prof. A. K. Panda, VP (Civil)  
6. Prof Y.K.SAHU, VP (Elec)  
7. Er D.BEHERA, Engineer (Elec)  
8. M/S Electrical Consultant Services ,BBSR

**NAME OF WORK: ELECTRICAL WIRING OF New Extension Blocks in Mining and Ceramic Buildings IN NIT, ROURKELA**

**QUESTIONNAIRE / INFORMATION TO BE SUBMITTED BY THE PROSPERITY BIDDERS**

Brief work plan (PERT/Bar Chart) for execution of the major projects within 18 months to be submitted.

1. What should be your site organization including engineers to be deployed at site?
2. Brief details of similar works executed by your firms during last 5 years. This should include cost, time of actual start/completion, analysis schedule, specifications adopted etc.

**REGISTRAR**

**National Institute of Technology**

**Rourkela-769008 (Orissa)**

**Fax: 0661-2472022**

**Ph No: 0661-2472021**

## **CHECK LIST FOR PRE-QUALIFICATION**

Forms to be filled in properly.

1. Form-A: This form (check list)
2. Form-B: Letter of Transmit
3. Form-C
4. Form-D
5. Photocopy of documents to be attached.
  - a) Valid license, Should include valid Electrical license of State of ODISHA.
  - b) Work orders executed of last 5 years.
- c) Vat Clearance Certificate & PAN Card.
  - d) Solvency Certificate from bankers to be submitted.
- d) Performance report from authority/officer having rank not below Executive Engineer for Govt./PSUs and General Manager for private firms with specific mention about the project components, scheduled and actual time of completion, final project value etc. to be submitted.
  - e) List of equipments in possession.

**(Signature of the Agency)**

**PRE-QUALIFICATION INFORMATION**

**LETTER OF TRANSMITTAL**

(To be typed on the Agency's Letterhead)

**To**

**THE REGISTRAR  
NATINAL INSTITUTE OF TECHNOLOGY  
ROURKELA - 769008**

**SUB: Electrical wiring of New Extension Block of Mining & Ceramic 3 storey Building under new construction in NIT, ROURKELA.**

Sir,

Having examined the details of pre-qualification document, I hereby submit the pre-qualification documents and other relevant information.

1. I hereby certify that all the statements made and information supplied in the enclosed forms A to D and accompanying statements are true and correct to the best of my knowledge. I understand that if any information found incorrect, the application is liable to be cancelled.
2. I have furnished all information and details necessary for pre-qualification and have no further pertinent information to supply.
3. I certify that my firm is not **blacklisted/banned** from business by any organization.
4. I hereby accept the rules and procedures of the Institute for pre-qualification of Contractor and agree that the Institute has the right to accept or reject any application without assigning a reason thereto.

**(Signature of the Agency)**

**NATIONAL INSTITUTE OF TECHNOLOGY,**  
**ROURKELA**

**APPLICATION FOR PRE-QUALIFICATION**

1. NAME OF AGENCY/FIRM: - \_\_\_\_\_
2. ADDRESS: - \_\_\_\_\_
3. FAX/TELEPHONE NUMBER: - \_\_\_\_\_
4. DETAILS OF REGISTRATION \_\_\_\_\_
  
5. ORGANISATION &SPECIAL QUALIFICATION FOR TECHNICAL PERSONS
  
6. PAN CARD, VAT CLEARANCE CERTIFICATE
  
7. VOLUME OF BUSINESS IN LAST THREE FINANCIAL YEARS  
2009-10           Rs \_\_\_\_\_  
2010-11 Rs \_\_\_\_\_  
2011-12           Rs \_\_\_\_\_
  
8. FIELD OF SPECIALIZATION
  
9. IMPORTANT JOBS EXECUTED IN GOVT./PSU INCLUDING SPECIFICATIONS, MATERIALS USED ETC.
  
10. IMPORTANT JOBS IN HAND AND THEIR STATUS
  
11. ANY OTHER INFORMATION REGARDING TECHNICAL CAPABILITY

**(Signature of the Agency)**

Annexure to application for pre-qualification

**WORKS COMPLETED AND IN PROGRESS DURING THE LAST 5 YEARS (INCLUDING ALL WORKS AWARDED)**

{ADD ADDITIONAL SHEETS, IF NECESSARY}

Sl. No.	Name of Work & Agreement No	Date of start	<u>Date of Completion</u>		Tendered Cost	Complete address of the Authority for whom the Work was done
			<i>Stipulated</i>	<i>Actual</i>		

# **PRICE BID**

(To be submitted in the Letter Pad of firm)

To  
The Registrar  
National Institute of Technology  
Rourkela – 769008.

**SUB:Electrical wiring of New Extension Block of Mining & Ceramic 3 storey Building under new construction in NIT, ROURKELA**

Dear Sir,

We are hereby submitting the price bid for the above mentioned work.

**Our quoted price is as given below from the schedule provided by NIT for the above mentioned work.**

_____ % <b>(In figure)</b>	{ _____ <b>(In words)</b>	} <b><u>BELOW</u></b>
	<b>OR</b>	
_____ % <b>(In figure)</b>	{ _____ <b>(In words)</b>	} <b><u>ABOVE</u></b>

The same percentage will be applicable to all the items.

Signed in the capacity of duly authorized to sign tenders for and behalf of

\_\_\_\_\_  
**Name of Firm**

\_\_\_\_\_  
**Signature**

Name & Address .....

Telephone No. ....

.....Mobile

No. ....

Date: .....

# TENDER DOCUMENT

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## NOTICE FOR INVITING TENDER

To

M/s \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Dear Sir,

**Sub :Electrical wiring of New Extension Block of Mining & Ceramic 3 storey Building under new construction in NIT, ROURKELA**

Sealed item rate tenders are invited in the prescribed form from prequalified contractors for execution of internal and external electrification for the proposed Electrical wiring of SSB Hall of residence Rear extension block **AT NIT ROURKELA (ORISSA)** as per following details.

- |    |                                      |   |                                       |
|----|--------------------------------------|---|---------------------------------------|
| a) | NAME OF THE WORK                     | : |                                       |
| b) | ESTIMATED COST OF THE WORK           | : | .....                                 |
| c) | EARNEST MONEY DEPOSIT                | : | .....                                 |
| d) | PERIOD OF COMPLETION                 | : | 24 Calendar Months                    |
| e) | VALIDITY OF TENDER                   | : | 90 Days                               |
| f) | DATE OF ISSUE OF TENDER              | : | From.....upto.....during office hours |
| g) | PRE-BID MEETING WITH CONTRACTOR      | : | ...28.01.2013.....at 10.30 A.M.       |
| h) | LAST DATE OF SUBMISSION              | : | 31.01.2013.....Upto 3 P.M.            |
| i) | DATE & TIME OF OPENING OF THE TENDER | : | ...31.01.2013.....at 3.30 P.M.        |

- 1) The clarification, if any, regarding this tender should be got clarified from the Registrar/Professor in charge( Elec Constn) . A prebid conference shall be arranged on 28.01.2013..... in the office of Director, National Institute of Technology, Rourkela - 769008(Orissa) to discuss the relevant points/clarification if any. "So that tenderers are well acquainted" with the details of the End.
- 2) Tender documents including all Bill of Quantities is available in Web site and can be down loaded by interested contractors.
- 3) The submission of bids by the Tenderer and opening of the same by REGISTRAR, NATIONAL INSTITUTE OF TECHNOLOGY, ROURKELA -769008(ORISSA) will be done as per procedure enumerated below:

- |                |  |
|----------------|--|
| ENVELOPE NO. 1 | To contain Bank Draft toward (i) Earnest Money deposit.  |
| ENVELOPE NO. 2 | To Contain techno commercial bids including reply to Questionnaires/ additional information.   |
| ENVELOPE NO. 3 | To contain the price bid in the prescribed form with overall percentage (in figures and word) over the total estimated cost which will be applicable to individual schedule rates for all items of work etc. of each work, signed and stamped on all pages of Tender Documents |

**NOTE:**

- a) Tenderers are advised not to make any alteration /modification in the Tender documents, item of work or any respect whatsoever. Violation of this requirement will make the tender liable for rejection.
- b) Envelope-I : Consisting of EMD.will be opened first on the due date of opening.
- c) Envelope-II : Will be opened subsequently on fulfillment of submission of EMD.on the same day.
- d) Envelope No.- III : On satisfying the eligibility criteria and that the tender who have confirmed the acceptance of NIT terms and conditions (both technical and commercial), the Envelope No-III (i.e. Price Bid) will be opened.

- 4 Tenders are to be submitted in one sealed envelope cover enclosing therein the Envelope No. 1, Envelope No.2 and Envelope No. 3.
- 5 The tenderer must use only the tender forms issued for the purpose to fill in the rates.
- 6 Rates should be quoted both in figures and words in columns specified. All erasures and alterations made while initials of the tenderer must attest filling the tender. Overwriting of figures is not permitted. Failure to comply with either of these conditions will render the tender invalid and it will be the discretion of DIRECTOR, NATIONAL INSTITUTE OF TECHNOLOGY ,ROURKELA -769008(ORISSA) to accept or reject the tender. No request of any change in rate or conditions after opening of the tender will be entertained.
- 7 In the case of figures, the word `Rs.' should be written before the figures of rupees and the word `P' written after the decimal figures e.g. Rs. 3.25 P. In the case of words, the word Rupee should similarly precede and the words "Paise only" should be written at the end, closely following each the percentage rate. The word "only" should not be written in the next line unless the rate quoted is in whole Rupees closely followed by the word "only": The amount should invariably be upto two decimal places.
- 8 Errors in the bill of quantities shall be dealt with in the following manner.
  - a. In the event of any discrepancy between the rates quoted in words and the rates in figures the former shall prevail.
  - b. In the event of an error occurring in the amount column of the bills of quantities as a result of the wrong extension of the unit rate and the quantity, the unit rate shall be regarded, as firm and extension shall be amended on the basis of the rates.
  - c. All the errors in totaling in the amount column and in carrying forward the totals shall be corrected.
- 9 Each of the tender documents should be signed by the person or persons submitting the tender in token of his/their having acquainted himself/themselves with the General and Special Conditions of Contract, Specifications etc., as laid down. Any tender with any of the documents not so signed will be subjected to rejection.
- 10 The tender submitted on behalf of a firm shall be signed by all the partners of the firm or by a partner who has the necessary authority on behalf of the firm to enter into the proposed contract. Otherwise the tender may be rejected by DIRECTOR, NATIONAL INSTITUTE OF TECHNOLOGY ,ROURKELA -769008(ORISSA).
- 11 No consideration will be given to a tender received after the time stipulated above and no extension will be allowed for submission of the tender. The Director shall have the right to reject any tender not conforming to prescribed procedure (or all tenders) without assigning any reason.
- 12 The time allowed for completion of works is 24 Calendars months (including monsoon period) for construction and the date of commencement of the work is reckoned from the fourteenth day from the date of Letter of Intent. Time shall be considered the essence of contract.
- 13 Water and electricity required for the completion of the construction shall be provided by the institute. However contractor will have to make arrangement of pipe line for water and electric poles wires cable etc. for electricity.
- 14 Every tender shall be accompanied by earnest money of Rs.....(1% of the estimated cost). By way of Demand Draft/Pay order favouring NATIONAL INSTITUTE OF TECHNOLOGY AT ROURKELA – 769008 (ORISSA). Tender Submitting without earnest money shall be summarily rejected.
- 15 The Earnest Money will be retained in the case of the successful tenderer as part of the security for due fulfillment of the Contract. No interest shall be paid on this deposit. Failure to enter into the contract agreement within the stipulated time of 20 days from the date of letter of Intent shall entail the forfeiture of the Earnest Money Deposit. The Earnest Money of unsuccessful tenderers will be released after issue of work order, without any interest.
- 16 The tenderer shall submit his tender after carefully examining the whole of the tender document and the terms and conditions of contract, the drawings and specifications, the schedule of quantities etc., and also after examining the site and conditions prevailing in and around site.
- 17 This notice inviting tenders, the conditions of tender and the duly completed form of tender etc., will form part of the Agreement to be executed by the successful tenderer with the Owner.
- 18 The Owner does not bind himself to accept the lowest or any tender and reserve to themselves the right of accepting the whole or any part of the tender and tenderer is bound to perform the same at the rates quoted. The owner will not be bound to accept the lowest tender and reserves the right to accept or reject any or all the tender without assigning any reasons whatsoever.

- 19 Tenders shall remain valid for a period of 120 days from the date of opening of the tender which period may be extended by mutual agreement and the tenderer shall not cancel or withdraw the tender during the initial validity period of 120 days.
- 20 The successful tenderer shall be bound to implement the Contract and mobilise and sign specified agreements within 20 days from the date of Letter of Intent/ Work Order.
- 21 Tenderers must include in their rates, sales tax (both CST & LST), cess excise duty, octroi, sales tax on works contract and any other tax & duty or other levy by the central and state government or any other tax & duty or other levy or to be levied in future by the central government or state government or local authority if applicable. No claim in respect of sales tax, excise duty, octroi, turn-over tax, sales tax on works contract or other tax, duty or levy etc., shall be accepted by the Owner, if found later on to be additionally payable. Deductions in respect of sales tax or turnover levied as per government notification and/or guidelines shall be made from the Contractor's interim and final bills, and deposited with the relevant authority by the Owner, on his behalf. Any shortfall in deposit thereof shall be made up by the contractor, before submitting his final bill.
- 22 This contract shall be an item rate contract. The Contractor shall be paid for actual quantity of work done, as measured at site including any deviation plus or minus. The rate of any non-schedule items of work shall be derived as per conditions of this contract.
- 23 The tender drawings exhibited/enclosed are preliminary drawings intended for the guidance of the Contractor only. They may be subject to revision and alteration without vitiating any of the terms of the contract and the Contractor shall be bound to execute the works as shown on the final drawings without claiming any extra payment.
- 24 No correspondence will be entertained in respect of this tender other than any clarifications strictly pertaining to this tender.
- 25 All the correspondence and documents shall be in English only.
- 26 The tender price quoted by a tenderer shall be kept strictly confidential and shall not be divulged to any other party even approximately before the time limit for delivery of tender. The only exception be for obtaining an insurance quotation, you may give your insurance company or agent any essential information they ask for, so long as it is done in strict confidence. No information about other's tender price should be obtained and no arrangement with any one else should be made whether or not he submit the tender.
- 27 For electrical, sanitary, water supply and drainage works, tenderers must possess respective licenses from the competent authority valid in Rourkela (Orissa), wherever applicable.
- 28 Contractor should sign at the end of every page prior to submitting the tender.

Director,  
National institute of Technology  
Rourkela -769008(Orissa)

## TENDER FORM

### NATIONAL INSTITUTE OF TECHNOLOGY ROURKELA – 769008 (ORISSA)

To be returned by \_\_\_\_\_ hours on \_\_\_\_\_. And to be opened at \_\_\_\_\_ hours on \_\_\_\_\_

To,

Registrar,  
National Institute of Technology ,  
Rourkela – 769008(Orissa)

#### **TENDER FOR :Electrical wiring of New Extension Block of Mining & Ceramic 3 storey Building under new construction in NIT, ROURKELA**

Sir,

1. We have read and examined the following documents as received by us :
  - a) Notice Inviting Tender
  - b) Instructions to Tenderers
  - c) Conditions of Contract.
  - d) Supplementary Conditions.
  - e) Specifications
  - f) Drawings
  - g) Schedule of Quantities.
  
2. We are well aware and are familiar with CPWD Schedule of Rates and their specifications, BIS publication and National Building code which shall apply to this contract to supplement any missing details in this contract in order of preference.

Further to the above, we have visited and examined the site of the proposed works and have acquired the requisite information relating thereto as affecting the tender invited by you.
  
3. We agree that any other terms or conditions of contract or any general reservation which may be printed on any correspondence emanating from us in connection with this tender or with any contract resulting from this tender shall not be applicable to this tender or to the contract.
  
4. We have obeyed the rules about confidentiality of tenders and will continue to do so as long as they apply.
  
5. We are enclosing along with our tender an earnest money being Rs. (1% of the estimated cost) in the form of Crossed Demand Draft on Nationalised Rourkela Bank. We hereby agree that this sum shall be forfeited by DIRECTOR, NATIONAL INSTITUTE OF TECHNOLOGY ,ROURKELA -769008(ORISSA) in the event of our tender being accepted and if we fail to execute the contract when called upon to do so. We note that Earnest Money Remittance in form other than Crossed Demand Draft on Rourkela Bank shall not be accepted.
  
6. Subject to and in accordance with paragraphs 3 & 4 above and the terms and conditions contained or referred to in the documents listed in paragraph 1, we agree and offer to execute all the Works referred to in the said documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered to be valued as per the conditions of contract.
  
7. We undertake to complete and deliver the whole of the works within a period as specified in the contract and further confirm that the time allowed for completion is adequate. Time allowed for completion of entire job or part job assigned shall be reckoned from the tenth day of the date of letter of intent. We shall be under the obligation to pay the sum as stated in the contract for every day that the works shall remain incomplete, damages as compensation subject to the conditions of contract relating to extension of time.

8. We hereby also agree that unless & until a formal agreement is prepared & executed in accordance with the Articles of agreement, this tender together with your acceptance thereof, shall constitute a binding contract between us.
9. The person/persons whose tender may be accepted (hereinafter called the tenderer) shall pay initial deposit of 2% (including Earnest Money) by way of Demand Draft in favour of NATIONAL INSTITUTE OF TECHNOLOGY, payable at Rourkela. This amount shall be released after virtual completion of work. We further agree for a deduction of 8% from the running bill as retention money.
10. Validity of the tender shall be 90 days from the date of opening of tender or it may be beyond 90 days if mutually accepted.
11. The Owner is at liberty to accept or reject any tender, without assigning any reasons whatsoever.
12. Work may be split up in the first instance. But it may be split up in more parts or parts combined if so desired by the Owner without assigning any reasons whatsoever.
13. Adherence to the PERT chart shall be ensured by the contractor as the project is to be executed in a very strict time frame.
14. In the event of our selection of award of work we agree to submit a PERT/BAR Chart based on the drawings along with the tender documents before the issue of work order. And this will form a part of the agreement.

Signed in the capacity of duly authorised to sign tenders for and on behalf of

Address .....

.....

.....

.....

Telephone No.....

Telex No.

Fax No.

Date :

## INSTRUCTIONS WITH REGARD TO SUBMISSION OF TENDERS

**NOTE:** Tenderers are requested to note that non-compliance of the following instructions is liable to render their tenders unacceptable.

- 1) Address at which the tender is to be submitted : REGISTRAR, NATIONAL INSTITUTE OF TECHNOLOGY , ROURKELA –  
769008(ORISSA)
  
- 2) a. Prebid conference date \_\_\_\_\_  
b. Last date for receipt of tender \_\_\_\_\_  
c. Date of opening of tender \_\_\_\_\_
  
- 3) The different Schedules should be filled as follows:  
(a) The "Rate" Column wherever applicable to be legibly filled in ink in both figures and words.  
(b) The "Amount" Column also to be legibly filled in ink in both figures and words.  
(c) All corrections to be initialed.  
(d) No over writing is allowed.  
(e) The figure of percentage of rate shall be legibly filled in ink in both figure and words.
  
- 4) Bank Guarantee or cheques shall not be accepted for the Earnest Money Deposit. “The Earnest Money Deposit should be in strict compliance of requirement as specified in the tender documents.
  
- 5) The tender shall be signed and dated at all places provided therein. Also all pages, drawings and corrections/alterations shall be initialed. The tender submitted on behalf of a firm shall be signed by all the partners of the firm or by a partner who has the necessary authority on behalf of the firm to enter into the proposed contract.
  
- 6) **CONDITIONAL OFFER:** Any tenderer who proposes alterations to any of the conditions/specifications laid down in the tender documents or proposes any new conditions, whatsoever shall be summarily rejected.
  
- 7) **PROCEDURE FOR SUBMISSION AND OPENING OF TENDERS :**
  - a) Tenders must be submitted on the tender documents issued by the Accepting Officer. Intimation of tender quoted by a letter, telegram or telex will not be accepted.
  
  - b) Tenderers are expected not to propose any alterations to any of the conditions laid down in the tender. Stipulated conditions embodied in the tender shall be binding on the tenderers.
  
  - c) In view of the postal and other delays the tenders should be posted sufficiently in advance of the last date and time fixed for receipt of tenders or be sent by a special messenger. Tender received late shall be rejected.
  
  - d) The procedure for submission and opening of tenders has been set out in details in tender documents.
  
- 8) Drawings must be returned along with the tender documents duly stamped and signed. These Drawings are for reference only.

### **VALIDITY OF TENDERS**

- 9) Tenderers should note that their tenders should remain open for consideration for a minimum period of 120 days from the last date fixed for the receipt of tenders. The validity period may, however be extended by mutual agreement. The tenderer shall not be allowed to cancel or withdraw the tender during the initial validity period of 120 days.
  
- 10) For Sewerage, Electrical, Water supply and Surface drainage works, Tenderers must possess respective licenses from the respective authorities valid in Rourkela for doing such works.

## **SUPPLEMENTARY CONDITION**

### **INDEMNITY BOND**

On the acceptance of his tender, the contractor will be required to execute an Indemnity Bond with-in 10 days of issue of work order in favor of the Owners against third party claims, civil or criminal complaints, site mishaps and other accidents or disputes, against any damages, loss or expenses due to or resulting from any negligence or breach of duty on the part of the contractor, his subcontractors or his employees and agents etc., as per the appropriate Indemnity Bond attached.

It will also be covered by labour laws of the Govt. of Orissa.

Any other conditions suggested by the Institute may be added subsequently.

**INDEMNITY BOND**

(On Non-Judicial Stamp Paper of Rs. 10/-)

KNOW all men by these presents that I/We \_\_\_\_\_ do hereby execute Indemnity Bond in favour of The Director, National Institute of Technology, Rourkela -769008(Orissa). On this \_\_\_\_\_ day of \_\_\_\_\_

WHEREAS The Director, National Institute of Technology, Rourkela -769008(Orissa), have appointed \_\_\_\_\_ as the Contractors for their Proposed in National Institute of Technology, Rourkela \_\_\_\_\_

THIS DEED WITNESS AS FOLLOWS :

I/We \_\_\_\_\_ hereby do Indemnify and save harmless The Director, National Institute of Technology, Rourkela -769008(Orissa).

Any third party claims, civil or criminal complaints/liabilities, site mishaps and other accidents or disputes and/or damages occurring or arising out of any mishaps at the site due to faulty work, negligence, faulty construction and/or for violating any law, rules and regulations in force, for the time being while executing/executed works by me/us.

Any damages, loss or expenses due to or resulting from any negligence or breach of duty on the part of me/us or my sub contractor's if any, servants or agents.

Any claim by an employee of mine/ours or of sub contractors if any, under the Workmen's Compensation Act and Owners Liability Act, 1939 or any other law, rules and regulations in force for the time being and any Acts replacing and/or amending the same or any of the same as may be in force at the time and under any law in respect of injuries to persons or property arising out of and in the course of the execution of the contract work and/or arising out of and in the course of employment of any workman/employee.

Any act or omission of mine/ours of sub-contractor's if any, our/their servants or agents which may involve any loss, damage, liability, civil or criminal action.

IN WITNESS WHEREOF THE \_\_\_\_\_ has set his/their hand on this day of \_\_\_\_\_.

SIGNED AND DELIVERED BY THE                      NAME AND ADDRESS

AFORESAID \_\_\_\_\_                      (Contractor)

IN THE PRESENCE OF WITNESSES:

1.

2.

**ARTICLES OF AGREEMENT**

ARTICLES OF AGREEMENT made the ..... date of .....  
..... between ..... having its offices at Rourkela  
(hereinafter called “the owner” of the One Part and .....  
.....  
..... (hereinafter called “The Contractor” of the other Part.)

Where the Employer is desirous of ..... and has caused drawings and specification describing the works to be done to be prepared by Arch-En Design, it’s Architect.

And whereas the said Drawings numbered ..... to ..... inclusive, the specifications and the schedule of Quantities with rates have been signed by or on behalf of the parties hereto.

And whereas the Contractor has agreed to execute upon and subject to the conditions set forth herein and to the conditions set forth herein in the Special conditions and in the Schedule of quantities and conditions of Contract (all of which are collectively hereinafter referred to as “the said Drawings and/or described in the said specifications and included in the Schedule of quantities at the respective rates therein set forth amounting to the sum as therein arrived at or such other sum as shall become payable there under (hereinafter referred to as “the said contract Amount”).

NOW IT IS HEREBY AGREED AS FOLLOWS:

In consideration of the said contract amount to be paid at the items and in the manner set forth in the said conditions, the contractor shall upon and subject to the said conditions executed complete the work shown upon the said Drawings and described in the said specifications and the priced schedule of quantities.

The Employer shall pay to the contractor the said contract amount, or such other sum as shall become payable, at the times and in the manner specified in the said conditions.

The term “the Architects” in the said conditions shall mean the said Arch-En Design, or in the event of their ceasing to be the Architects for the purpose of this contract for whatever reason, such other person or persons as shall be nominated for that purpose by the Employer, not being a person to whom the contractor shall object for reasons considered to be sufficient by the Employer, **Provided Always** that no person or persons subsequently appointed to be Architects under this contract shall be entitled to disregard or overrule any previous decisions or approval or direction given or expressed in writing by the outgoing Architects for the time being.

The said conditions and Appendix thereto shall be read and construed as forming part of this Agreement, and the parties hereto shall respectively abide by, submit themselves to the said conditions and perform the Agreements on their part respectively in the said conditions contained.

The plans, agreements and documents mentioned here in should form the basis of this Contract.

This Contract is neither a fixed lump-sum contract nor a piece work contract but a contract to carry out the work in respect of the building complex, to be paid for according to actual measured quantities at the rates contained in the Schedule of Quantities and Rates or as provided in the said Conditions.

The contractor shall afford every reasonable facility for the carrying out of all works relating to civil works, installation of telephone, electrical installations, fittings, and other ancillary works in the manner laid down in the said conditions, and shall make good any damages done to walls, floors, etc. after the completion of his work.

The employer reserves to itself the right of altering the drawings and nature of the work by adding to or omitting any items of work or having portions of the same carried out without prejudice to this contract.

Time shall be considered as the essence of this contract and the contractor hereby agrees to commence the work soon after the site is handed over to him or from 14<sup>th</sup> day after the date of issue of formal works order as provided for in the said conditions whichever is later and to complete the entire work within twenty four calendar months, subject to nevertheless to the provisions for extension of time.

All payments by the Employer under this contract will be made only at Rourkela.

All disputes arising out of or in any way connected with this agreement shall be deemed to have arisen at Rourkela and only the courts in Rourkela shall have jurisdiction to determine the same.

1. That the several parts of this contract have been read by the contractor and fully understood by the contractor.

IN WITNESS WHEREOF THE EMPLOYER and the contractor have set their respective hands to these presents and two duplicates hereof the day and year first hereinabove written.

**SIGNATURE CLAUSE**

SIGNED AND DELIVERED by the

\_\_\_\_\_ by name  
(Employer)

hand of Shri \_\_\_\_\_

\_\_\_\_\_  
(Name and Designation)

(Signature of Employer)

In the presence of:

Shri / Smt. \_\_\_\_\_

Address \_\_\_\_\_

(Signature of witness)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(Witness)

SIGNED AND DELIEVERED by the

\_\_\_\_\_

(Contractors)

(Signature of Contractors)

In the presence of:

Shri/Smt. \_\_\_\_\_

(Signature of witness)

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(Witness)

## GENERAL INSTRUCTIONS TO CONTRACTORS

### AND SPECIAL CONDITIONS

- 1) Sealed Tenders should be addressed to The Registrar, National Institute of Technology, Rourkela -769008(Orissa).
- 2) No Tender will be received after the due date under any circumstances whatsoever.
- 3) The contractors are not expected to include any conditions contrary to tender provisions. However, if it is necessary to include certain conditions, the same should be submitted in a separate sealed cover. To facilitate the processing of offers, two separate sealed covers, and one containing priced tender and second containing Earnest Money Deposit should be submitted. The covers should be suitably subscribed indicating the contents.
- 4) **(a)** The envelope one shall contain earnest money deposit, terms and conditions, if any, imposed by the contractor for the subject tender shall be opened first in the Office of The Registrar, National Institute of Technology, Rourkela -769008(Orissa) in the presence of the Architects and the authorized representative of the tenderers.  
**(b)** The covers received as indicated in 4 (a) above, shall be opened first the second cover containing the priced Tender on item-rate basis will be opened after finding the tenders eligible for the same.  
**(c)** Priced Tenders shall remain open to acceptance by the Owners for a period of four months, from the date of opening of the second cover containing the Tender, which period may be extended by mutual agreement and the Tenderer shall not cancel or withdraw the Tender during this period.  
**(d)** The tenderer must use only the Forms issued by the Registrar, National Institute of Technology, Rourkela -769008(Orissa) to fill in the rates.
- 5) **(a)** The Tender Form must be filled in English and all entries must be made by the hand and written in ink, If any of the documents is missing, or unsigned, the Tender may be considered invalid by the owners in its discretion.  
**(b)** Each of the Tender documents should be signed by the person or persons submitting the Tender in token of his/ their having acquainted himself/themselves within the General condition of Contract, specifications, special conditions, etc., as laid down. Any Tender with any of the documents not so signed will be rejected.  
**(c)** The Tender submitted on behalf of a Firm shall be signed by all partners of the Firm or by a partner who has the necessary authority on behalf of the Firm to enter into the proposed contract. Otherwise the Owners may reject the Tender.
- 6) The owners do not bind themselves to accept the lowest or any tender and reserve to themselves the right to accept or reject any or all the Tenders, either in whole or in part, without assigning any reasons for doing so.
- 7) Intending Tenderers shall pay as Earnest Money deposit shall be Rs. 1% of the total estimated cost by Bank Draft drawn in favour of National Institute of Technology, payable at Rourkela. A Tender which is not accompanied by such an Earnest Money will not be considered. The Earnest Money will be returned to the Tenderer if his tender is not accepted, but without any interest.
- 8) The successful Tenderer shall within fifteen days of the receipt of the advice of acceptance of the Tender by Registered A.D.Post, deposit as further security, a sum balance of Rs.2% of contract amount after deducting Earnest money deposit paid by him when he submits his Tender shall be held by Registrar, National Institute of Technology, Rourkela -769008(Orissa), as initial security for the execution of the due fulfillment of the contract.
- 9) On receipt of intimation from the Owner of the acceptance of his/their Tender, the successful Tenderer shall be bound to implement the Contract and within Twenty days thereof, the successful Tenderer shall sign an Agreement in accordance with the successful Tenderer shall sign up Agreement in accordance with the draft Agreement and the schedule of conditions, but the written acceptance by Director, National Institute of Technology, Rourkela -769008(Orissa) of a Tender will constitute a binding Contract between Director, National Institute of Technology, Rourkela -769008(Orissa) and the person so tendering, whether such formal agreement is or is not subsequently executed.
- 10) 50% of retention money and total of initial security deposit will be returned after virtual completion of the work. Balance 50% of retention money shall be released to the contractor after satisfactory completion of defect liability period (this amount will be kept in fixed Deposit with the Institute after the work is virtually completed and the same will be returned along with interest after satisfactory completion of defect liability period).
- 11) The total security deposit shall comprise of EMD+ Initial Security Deposit + Retention Money.

The amount of initial security deposit shall be 2% of the accepted value of the tender including the EMD. The amount of initial security deposit shall be paid within 14 days of intimation of the acceptance of this tender.

In addition to the initial Security Deposit, 8% of the running bill amount will be deducted as retention money till total security deposit amount is achieved.

- 12) The contractor shall not assign the contract. He shall not subject any portion of the contract except with the written consent of the Employer subcontracting to Electrical Partner having a valid electrical license. In case of breach of these conditions, the Employer may cause the Architect to serve a notice in writing on the contractor rescinding the contract whereupon the Security Deposit shall stand forfeited to the Employer, without prejudice to his other remedies against the contractor.
- 13) The contractor shall carry out all the work strictly in accordance with Drawings, details and instructions of the Architect, Consultant and the Employer. If in the opinion of the Architect, consultant or the Employer, changes have to be made in the design and with the prior approval in writing of the Employer, they desire the contractor to carry out the same, the contractors shall carry out the same without any extra charge. The Architect's/ The Director, National Institute of Technology, Rourkela - 769008(Orissa) decision in such cases shall be final and shall not be open to arbitration.
- 14) A Schedule of probable quantities in respect of each work and specifications accompany these special conditions. The Schedule of probable quantities is liable to alteration by omission, deductions or additions at the discretion of the Architect/ The Director, National Institute of Technology, Rourkela -769008(Orissa).
- 15) The Tenderer must obtain for himself on his own responsibility and at his own expenses all the information which may be necessary for the purpose of making a Tender and for entering into a contract and must examine the drawings and must inspect the site of the work and acquaint himself with all local conditions, means of access to the work, nature of the work and all matters pertaining thereto.
- 16) The rates quoted in the Tender shall be inclusive of all charges for clearing of site before commencement as well as after completion, water, electrical consumption, meters, double-scaffolding, centering, boxing, staging, planking, timbering and pumping out water, including bailing, fencing, , hoarding, plant and equipment, storage sheds, watching and lighting by night as well as day, including Sundays and Holidays, temporary plumbing and electric supply, protection of the public and safety of adjacent roads, streets, cellars, vaults, open pavements, walls, houses, buildings and all other erections, matters or things and the contractor shall take down and remove any or all such centering, scaffolding, staging, planking, timbering, strutting, shoring, etc. as occasion shall require or when ordered so to do, and fully reinstate and make good all matters and things disturbed during the execution of the work and to the satisfaction of the Architect. No claim in respect of Sales Tax on work contract, Service Tax, Excise Duty, Octroi or other Tax, Cess, Duty or Levy whether existing or future shall be entertained by the Employer.
- 17) Time allowed for carrying out the work as mentioned in the Memorandum shall be strictly observed by the contractor and its shall be reckoned from the 10 days after written order to commence the work is issued or the date of handing over the site to the contractor whichever is later. The work shall throughout the stipulated period of the contract be proceeded with all due diligence and if the contractor fails to complete the work within the specified period, he shall be liable to pay compensation as defined in the conditions of contract: " The Conditions Herein before Referred To". The Tenderer shall before commencement of the work, prepare a detailed work programme which shall be approved by the Architect and the Employer.
- 18) The contractor shall not be entitled to any compensation for any loss suffered by him on account of delays in commencing or executing the work, whatever the case of delays may be, including delays arising out of modifications to the work entrusted to him or in any sub-contract connected therewith or delays in awarding contracts for other trades if the project or in commencement or completion of such works or in procuring government controlled or other building materials or in obtaining water and power connections for construction purposes or for the other reasons whatsoever and the Employer shall not be liable for any claim in respect thereof. The Employer does not accept liability for any sum besides the Tender amount, subject to such variations as are provided for herein.
- 19) The successful Tenderer is bound to carry out any items of work necessary for the completion of the job even though such items are not included in the quantities and rates. Schedule of instructions in respect of such additional items and their quantities will be issued in writing by the Architect with the prior consent in writing of the Employer.
- 20) The successful Tenderer must co-operate with the other contractors appointed by the Employer so that the work shall proceed smoothly with the least possible delay and to the satisfaction of the Architects.
- 21) The contractor must bear in mind that all the work shall be carried out strictly in accordance with the specifications made by the Architects and also in compliance of the requirements of the Authorities concerned and no deviation on any account will be permitted.
- 22) Water Supply
  - a. Raw water for works and drinking water shall be supplied free of cost by the employer to the contractor at suitable points within 300 meters of each section of the work. The contractor cannot claim compensation for any failure in water supply

caused due to any reason whatsoever.

- b. The contractor shall be responsible to store water in sufficient quantities to meet his requirements in well built storage tanks with covered top to prevent entry of foreign material, dust, smoke etc.
- c. Potable water for domestic use for contractor's colonies shall be supplied free of cost by the employer at central tank in the labour camps provided that these camps of the contractors are located in the areas developed by the employer for the purpose.
- d. The contractor is responsible to ensure that there is no wastage of water raw or domestic. He will also be responsible for maintaining the tank, pipe lines etc. in proper condition.

#### Electric Power for Construction Purposes

- a. The employer will install and operate a power station of adequate capacity to supply and demand for the construction equipment and for lighting 5 K.W. 440/3-phase AC Supply will be made available to the contractor in bulk of the distribution centres within 100 meters of lead mentioned in works areas free of charges. The contractor will have to make his own arrangements to lay and maintain the necessary distribution lines and wiring for the works at his cost. Within 14 days of acceptance of contract by letter, the contractor should give his firm demand of power at various points. In tendering, an approximate indication of this should be given.
- b. Contractor may, subject to the approval of the Engineer, his labour camps in areas other than those laid out by the employer. In that event the contractor shall make his own arrangement for water and electricity.
- c. The contractor shall ensure that the electrical equipment deployed by him will be such that the aggregate power factor not fall below 0.5 at the owner's terminal points.
- d. The installation of fixed construction machinery and the points for tapping of electric supply connection from pipe lines of different kinds, and location of temporary building including labour camps and storages for materials, should be approved in advance by the engineer.
- e. The source of power to be made available for the contractor would be within 100 meters from the site of work..
- f. The contractor will supply and install switch, fuse units of suitable rated and capacity separately for power and lighting on a frame preferably of steel and provide rain water protection on the switches. The installation will be made as relevant I.S. rules and site location to be made in consultation with engineer- in-charge of the site.
- g. The contractor will get his installation inspected by the Asstt. Electrical Inspector, Govt. of Orissa Deputy Director, Central Electricity authority Ministry of Power, Government of India and obtain a certificate for energisation of the installation.
- h. The contractor will supply and install all distribution cables, wires and switches etc. of rated capacity for the work starting from the source of power at his own cost. He will employ Electricians possessing Electrical contract Licence (copy to be submitted) for carrying out the installation as well as the maintenance works.
- i. The contractor will provide proper facilities to the Engineer-in-charge concerned or his authorised representative for inspecting his temporary electrical installation as and when required. He will immediately attend to the defects so pointed out during this inspection including replacement of faulty cables, switches etc.
- j. The contractor shall not effect any changes in the temporary installation unless permission is obtained from concerned engineer (Elect.) or his authorised representative.

23) The Contractor shall strictly comply with provision of safety code annexed hereto.

24) The contractors shall fulfill the requirements of the Employees State Insurance Act,1948 applicable to all States, towards their employees and keep all the required record regarding the same for inspection by the Authorities concerned at any time. The contractor shall indemnify Registrar, National Institute of Technology, Rourkela-769008 (Orissa), against any claim or legal action arising out of the said Act due to the failure of non-compliance of the provisions of the said Act and the penalty or any other amount levied by the authorities, shall be recoverable from the payments due to the contractors.

25) The Contractor shall comply with the provision of the Apprentices Act,1961, and the Rules and Orders issued there under from time to time. Failure to do so will be in a breach of the contract and the Architects and the Owners may in their discretion cancel the contract. The contractor shall also be liable for any pecuniary or other liabilities arising on account of any violation by him of the provisions of the Act.

26) The Security Deposit of the successful Tender will be forfeited if he fails to comply with any of the conditions of the contract.

27) The contractor shall be responsible for the observance of all Central Rules and Regulation framed by the Central Government under the Contract Labour (Regulation and Abolition) Act,1970and Indian Electricity Rules & Regulations and safetyof thepersons and Electrical installations. The Owners shall be entitled to deduct all damages, which it might suffer on account of non-observance of these rules by the Contractor, from the amount payable to the Contractor.

#### **Mobilisation Advance**

Mobilisation Advance can be given at the discretion of the owner against bank guarantee.at an interest 12% Mobilisation Advance upto 10% of contracted value payable in two equal installments. The first installment shall be paid after Mobilisation has started and next installments shall be paid after satisfactory utilization of earlier advance (s).

The recovery of the Mobilisation Advance shall start when 15% of the work is executed and recovery of total advance should be complete by the time 80% of the original contract price is executed.

**Advance against materials brought at Site:**

**Secured Advance on Materials**

Contractor may be allowed Secured advance on security for materials brought to site for execution on contracted item of work upto the extent of 75% of the value of the materials assessed to by the Engineer-in-charge provided that the materials of the imperishable nature and that of the formal agreement drawn up with the contractor under which employer secures a lien on the materials and is safeguarded against losses due to the contractor postponing execution of the work or to the storage or misuse the materials and against the expenses entitled for their proper watch and safe custody. Recoveries of advances so made would not be possessed until the whole of the work entrusted to the contract is completed. They should be adjusted from his bills for work done as the materials are used with the necessary deductions being made. The secured advance may be given against the following materials brought to the site and stored properly.

- a. Cement
- b. Steel
- c. Wood
- d. Flooring/ Wall tiles
- e. Aluminium/ Wooden window and door frame
- f. Plumbing / Sanitary / Fixtures and Fittings
- g. Electrical Items (One time only)

75% of the total cost of materials purchased and brought at site.

Advance against the materials at Site will be paid only after verifying the quantity of materials received at the Site of work.

The Contractors will have to submit the bills for the materials purchased, in triplicate, to verify the cost of the materials purchased and brought at Site.

No advances against perishable materials purchased and brought at Site will be made.

The Contractors will have to keep the materials at Site under their safe custody and at their risk and cost.

The Owner is not responsible for damages and losses of such materials brought a Site.

- 28) Contractors are not allowed to remove materials brought at Site against which advances have been paid.
- 29) The Contractor is to provide at all times during the progress of the works and the maintenance period proper means of access, with ladders, gangways, etc., and the necessary attendance to move and adopt as directed for the inspection or measurement of the works by the Architects or their representatives.
- 30) Materials shall be of approved quality and the best of their kind available and shall generally conform to I.S. Specifications. The Contractor shall order all the materials required for the execution of work as early as necessary and ensure that such materials are on site well ahead or requirement for use in the work. The work involved calls for approved standard of workmanship combined with speed and to the entire satisfaction of the Architects.
- 31) The Contractors shall after completion of the work clear the Site of all debris and left over materials at his own expenses to the entire satisfaction of the Architects and Municipal or other public authorities.
- 32) The proposed work under this tender during its progress and after completion can be examined/inspected by the Chief Tech. Examiner/Tech. Examiner of CVC or any other Vigilance Authority appointed by the department. Any correction/ redoing of the work/deduction in the payment suggested by such Authority will be binding on the contractor.
- 33) The rates for variated/deviated/ or non schedule items to be worked out on the rates quoted in the tender for the similar items. Wherever it is not possible to base the rates for variated/deviated/non schedule extra items on the tender quoted rates then the rate analysis is to be submitted by the contractors as under and get the same approved before execution of the work by the command Architect.

Actual cost of materials	..... Rs.
Add for Labour charges	..... Rs.
Add for Taxes, Transportation, If any.	..... Rs.
Add for Wastage of Materials (Upper Limit 5% wherever applicable).	..... Rs.
Add for water and electricity Charges if any required, upper limit 2% of basic cost of materials.	.....Rs.
Add for 15% towards contractor’s overheads and profit.	.....Rs.

Rs.....

Final rate arrived.

Rs.....

- 34) Contractors are requested to note that no extra item or deviated item of work to be executed without taking prior permission, the institute shall not be responsible for the payment of such works executed. Contractors will have to submit all the particulars including purchase bills/price list for the materials along with the rate analysis for verification of item rates.
- 35) The rates quoted in the tender should be inclusive of contract Sales Tax, Turn over Tax. It is contractor's responsibility to pay the taxes to the Authorities concerned and produce documentary evidence of the taxes paid, to the Owners on demand.
- 36) If it is observed the existing compound wall, gates railings are damaged then the contractors will have to make good the same at their own cost.
- 37) If contractors fail to pay the taxes/royalties to the Authorities concerned, the Owners reserve their rights to recover the said amount from the amount payable to the contractor and pay the same to the Authorities concerned.
- 38) Work is to be executed & measurements are to be paid as per the detail specification & description of item given in the Standard Specification Book except for the items which are specifically mentioned in the tender for which the details of item and mode of measurements to be followed as indicated separately in the conditions of contractors, Part-I.
- 39) For Sanitary plumbing work and storm water drain, wherever it is indicated C.P.W.D. details for these items to be followed as per the description/ specification given in the Book published by Central Public Works Department.
- 40) Employer's decision in this regard shall be final and binding.
- 41) After awarding the work, contractor shall get registered with the office of the Labour commissioner and inform Employer accordingly.  
Contractors shall follow all rules and regulations stipulated by the Labour Commissioner strictly.
- 42) Contractors shall quote consistent rates for the items of similar nature or analogous in specifications for the sections in schedule of quantities. If it is observed that the rates quoted for similar nature of items or analogous in specification under different sections, are inconsistent, then the Employer reserves his right to consider the lowest of rates for all such items and work out the final amount for payment, unless the competent authority finds that there is justifications for such inconsistent rates.

I/We hereby declare that I/We have read and understood the above instructions for the guidance of Tenders.

Witnesses :

Signature of Tenders.

Date :

Address :

**THE CONDITIONS HEREINBEFORE REFFERED TO**

- 1. In construction these conditions, the specification schedule of quantities and contract agreement, the following words shall have the meanings herein assigned to them expect where the subject or context otherwise requires.
  - (a) **“Employer”** shall mean “Director, National Institute of Technology, Rourkela -769008(Orissa).
  - (b) **“Contractors”** shall mean.....and shall include his (their) legal representative assigns or successors.
  - (c) **“Site”** shall mean “Work Place located at Rourkela include any building and erections any building and erections thereon and any other land (inclusively), as aforesaid, allotted by the employer for the contractor's use.
  - (d) **“This Contract”** shall mean Articles of Agreement, the special conditions, the conditions, the appendix, the schedule of quantities and specifications, attached hereto and duly signed.
  - (e) **“Notice in writing”** or written notice shall mean a notice in written, typed or printed characters sent (unless delivered personally or otherwise proved to have been received), by registered post to the last known private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post, it would have been delivered.

- (f) **“Act of Insolvency”** shall mean any Act of Insolvency as defined by the Presidency Towns Insolvency Act, or the Provincial Insolvency Act or any amending such original.
- (g) **“Net Prices”** If in arriving at the contract amount, the contractor shall have added to or deducted from the total of the items in the Tender any sum either as a percentage or otherwise, then the net price of any item in the Tender shall be the sum arrived at by adding to or deducting from the actual figure appearing in the Tender as the price of that item a similar percentage or proportion of the sum so added or deducted of the sum so added or deducted by the contractor the amount of any Prime Cost items and provisional sums of money shall be deducted from the total amount of the Tender. The expression “net rates” or “net prices” when used with reference to the contract or accounts shall be held to mean rates or prices so arrived at.

Words importing persons include firms and corporations. Words importing the singular only also include the plural and vice versa where the context requires.

2. The Contractor shall carry out and complete the said work in every respect in accordance with this contract and of with the directions of and to the satisfaction of Architect/Employer. The Architect may in his absolute written instructions, details directions and to as Architect/Employer. The Architect may in his absolute discretion and in consultation with the employer (with prior approval from the Director) and from time to time issue further drawings and/or written instruction, details directions and explanations which are hereafter collectively referred to as “Architect’s/Employer’s Instruction”.

In regard to :-

- (a) The variations or modifications of the design, quality or quantity of works or the additions or omission or substitution of any work.
- (b) Any discrepancy in the drawings or between the schedule of quantities and/or drawings and or drawings and or specification.
- (c) The removal from the site of any materials brought thereon by the contractor and the substitution of any other materials therefore.
- (d) The removal and/or re-execution of any works executed by the contractor.
- (e) The dismissal from the works of any person employed thereupon.
- (f) The opening up for inspections of any work covered up.
- (g) The amending and making good of any defects under clauses 19 hereon.

The contractor shall forthwith comply with and duly execute and work comprised in such Architect’s/Employer instructions, provided always that the verbal instruction, directions, and explanations given to the contractor or his representative upon the works by the Architect/Employer shall, if involving a variation, be confirmed in writing by the contractor within seven days, and if not dissented from in writing within a further seven days by the architect, such shall be deemed to be Architect’s/Employer instructions within the scope of the Contract.

3. The work shall be carried out strictly in accordance with particular specifications and drawings. The drawings, specifications BOQ etc. shall be taken complementary and also supplementary to each other and shall form part this contract. Any work or material shown on drawings and not specifically included in BOQ/specification or vice versa shall be executed and deemed to be included in the scope of work .
4. Incase there are no specifications for items shown on the drawings or where items are not exhaustively described, the general specifications of CPWD shall be followed for which nothing extra shall be paid. In case, no details are available even in CPWD specifications, then decision of Institute is final & binding on the contractor.
5. The scope of work for buildings under this contract includes for full & final and entire completion of all works including all internal and external services in all respects described in particular specification as shown on drawings forming part of the contract.
6. Although all the details of construction have been by an large covered in these documents, any item or details of construction not specifically covered but obviously implied and essential to consider Civil Works and all internal and external services complete and functional, shall be deemed to have been covered in the contract. The cost of external development works pertaining to a particular contract shall also be carried out on a final lump sum price based on the rates quoted for each item. The tenderer may however, consider a minimum level of specifications conforming to IS code or National Building Code to cover any missing details.

## 7. Variations to be approved by the Employer/Architect.

Notwithstanding anything herein contained, the Architect or his representative shall not, without prior concurrence in writing of the Employer, issue any instructions, verbal or in writing, the Architect can get the work done upto an amount of

Rs. 25,000/- (Rupees Twenty Five Thousand) and all instruction issued to the contractor should forth with brought to notice of the Employer. The contractor shall submit through the Architect, a statement of variations giving quantity any rates duly scrutiny and final acceptance by the Employer shall form a supplementary tender the Employer shall not be liable for payment of such variations until these statements are sanctioned by him.

### **Drawings and Schedule of quantities and agreement.**

8. The contract shall be executed in triplicate, the cost incurred to the same shall be reimbursed by the contractors to the Architect and the Architects, the Employer and the contractor shall be entitled to one executed copy each for his use. The Contractor on the signing hereof shall be furnished by the Architects, the Employer and the contractor shall be entitled to one executed copy each for his use. The contractor on the signing hereof shall be furnished by the Architects free the specifications and one copy of all further Drawings issued during the progress of the works. Any further copies of such drawings required by the contractor shall be paid by him. The contractor shall keep one copy of all drawings on the works and the Architects/Employers or their representatives shall at all reasonable times have access to the same. Before the issue of the final certificate to the contractor, he shall forthwith return to the Architect all Drawings and Specifications.
9. The contractor shall provide everything necessary for the proper execution of the works according to the intent and meaning of the Drawings, Schedule of quantities and Specification taken together whether the same may or may not be particularly shown or described therein provided that the same can be reasonably be inferred there from, and if the contractor finds any discrepancies therein, he shall immediately and in writings, refer the same to the Employer /Architect whose decision shall be final and binding. The contractor shall provide himself for ground and fresh water for carrying out of the works at his own cost. The Employer shall on account be responsible for the expenses incurred by the contractor for hired ground or fresh water obtained from elsewhere.

The rates quoted against individual items will be inclusive of everything necessary to complete the said items work within the contemplation of the contract, and beyond the unit price no extra payment will be allowed for incidental or contingent work, labour and /or materials inclusive of all taxes and duties whatsoever except for specific items, if any, stipulated in the tender documents.

The contractor shall supply, fix and maintain at his own cost, for the execution of any work, all tools, tackles, machineries and equipments and all the necessary centering, scaffolding, staging, planking, timbering, strutting, shoring, pumping, fencing, boarding, watching and lighting by night as well as by day required not only for the proper execution and protection of the said work but also for the protection of the public and safety of any adjacent roads, streets, walls, houses, buildings, all other erections, matters and things and the contractor shall take down and remove any or all such centering, scaffolding, plumbing, timbering, strutting, shoring etc., as occasion shall be required or when ordered so to do, and shall fully reinstate and make good all matters and things disturbed during the execution or when ordered so to do, and shall fully reinstate and make good all matters and things disturbed during the execution of works to the satisfaction of the Employer / Architects.

The Contractor shall also provide such temporary load on the site as may be necessary for the proper performance of the contract, and for his own convenience but not otherwise. Upon completion, such roads shall be broken up and leveled where so required by the drawings unless the Employer shall otherwise direct.

The contractor shall at all times give access to workers employed by the Employer or any men employed on the buildings and to provide such parties with proper sufficient and if required, special scaffolding, hoists and ladders and provide them with water and lighting and leave or make any holes, grooves etc., in any work, where directed by the employer as any be required to enable such workman to lay or fix pipes, electrical wiring, special fittings etc. The quoted rates of the tenderers shall accordingly include all these above-mentioned contingent works.

### **Authorities notices and patents.**

10. The contractor shall confirm to the provisions of any Act of the legislature relating to the works, and to regulations and bye-laws of any authority, and of any water electric supply and other companies and /or authorities with and whose the systems the structures is proposed to be connected, and shall, before making any variations from the drawing or specifications that may be necessitated by so confirming, give to the Architect written notice, specifying the variations proposed to be made and the reason for making it and apply for instructions thereon. In case the contractor shall not within ten days receive such instructions he shall proceed with the work confirming to the provisions, regulations, or

bye-laws in questions, and variations so necessitated shall be dealt with under clause 13 hereof.

The contractor shall bring to the attention of the Architect all notices required by the said Acts, regulations or bye-law to be given to any authority and pay to such authority, or to any public office, all fees that may be properly chargeable in respect of the said work, and lodge the receipt with the Architect.

### **Setting out of work.**

11. The contractor shall set out the works and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, dimensions, and the alignment of all the parts thereof. If at any time any error in this respect shall appear during the progress of the work or within the period of one year from the completion of the works, the contractor shall, if required at his own expenses rectify such error to the satisfaction of the Architect / Employer.
12. All the works specified and provided for in the specifications or which may be required to be done in order to perform and complete any part thereof shall be executed in the best and most workman like manner with materials of the best and approved quality of the respective kinds in accordance with the particulars contained in and implied by the specifications and represented by the drawings or according to such other additional particulars and instructions as may from time to time be given by the Employer / Architects during the execution of the work, and to his entire satisfaction.

If required by the Employer / Architect the contractor shall have to carry out test on materials and workmanship in approved materials testing laboratories or as prescribed by the Employer/ Architects at own cost to proved the materials etc., under test confirm to the relevant I.S. Standard or as specified in the specifications. The necessary charges for preparation of mould (in case of concrete cube) transporting testing etc. shall have to borne by the contractors. No extra payment on this account should in any case be entertained.

All the materials (except where otherwise described) store and equipment required for the full performance of the work under the contract must be provided through normal channels and must include charges for import duties, sales tax, octroi and other charges and must be the best of their kind available and the contractors/must be entirely responsible for the proper and efficient carrying out the work. The work must be done in the best workman like manner. Samples of all materials to be used must be submitted to the Employer / Architect when so directed by the Engineer/Architect and written approval from Employer / Architect must be obtained prior to placement of order.

During the inclement weather the contractor shall suspend concreting and plastering for such time as the Employer / Architect may direct and shall protect from injury all work when in course of execution. Any damage (during construction) to any part of the work for reasons due to rain, storm, or neglect of contractor shall be rectified by the contractor in an approved manner at no extra cost.

Should the work be suspended by reason of rain, strike, lock-outs or any other new work and supply all temporary / doors, protection to windows, and any other requisite protection to windows, and other requisite protection for the execution of the work whether by himself or special for the execution of the work whether by himself or special tradesmen or sub-contractor at his own expenses.

### **Contractor superintend & representative on the works.**

13. The contractor shall give all the necessary personal superintendence during the execution of the works, and as long thereafter as the Employer/Architect may consider necessary until the expiration of the defects liability period stated in the Appendix hereto. The contractor shall also during the whole time the works are in progress employ a competent representative who shall be in constantly attendance at work while the men are at work. Any directions, explanations, instructions, or notices given by the Employer/Architect to such representative shall be held to be given to the contractor.

For day to day site supervision contractor has to provide 10 years experienced qualified Graduate Civil Engineer at site as representative of the contractor and shall be available through out the day during work is under progress. For non-compliance an amount of Rs.25,000/- pm shall be deducted from the contractor for the period of work carried out without the supervision of such Engineer. However, deduction of payment shall not exonerate contractor for his responsibility for executing quality work.

### **Dismissal of workmen.**

14. The contractor shall at the request of the Employer/Architect immediately dismiss from the works, any person employed thereon by him who may in the opinion of the Employer/Architect incompetent or misconduct himself and such person shall not be again Employer/Architect to such representative shall be held to be given to the contractor.

### **Access to work.**

15. The Employer, the Architect and their responsible representative shall at all reasonable times have free access to the works and/or to the workshops, factories or other places where materials are being prepared or constructed for the work and also to any place where the materials are lying from which they are being obtained the contractor shall give every facility to the Employer, the Architect and their representative necessary for inspection and examination and test of the materials and the workmanship. No. persons not authorised by the Employer or the Architect except the representatives of Public Authorities shall be allowed on the works at any time.

### **Asst. Engineer/Site/Engineer/Construction Manager**

16. The term Site Engineer/Construction Manager shall mean the person appointed and paid by the Employer and acting under the orders of the Employer / Architect to inspect the works in the absence of the Employer / Architect to inspect the works in the absence of the Architect, the contractor shall afford the Assistant Engineer/Site Engineer/Construction Manager every facility and assistance for inspecting the works and materials and checking and measuring time and materials item and materials. Neither Assistant Engineer/Site Engineer/Construction Manager nor any representatives or the Architect shall have power to set out works or to revoke, alter, enlarge or relax any requirements of the contract, or to sanction any day work, additions, alterations, deviation or omission, or any extra work whatever except in so far as such authority may be specially conferred by a written order of the Architect with the prior concurrence in writing of the Employer.

Technical staff should be specified and penalty should be imposed for non availability of technical staff.

The Assistant Engineer/Site Engineer/Construction Manager or any representative of the Architect, or the Employer shall have power to give notice to the contractor or to his representative, of non-approval of any work or materials and such work shall be suspended or the use of such materials shall be discontinued until the decision of the Architect is obtained. The work will be from time to time be examined by the Architect, the Employer's Engineer or the Architects representative, but such examination shall not in any way exonerate the contractor from the obligations to remedy any defects which may be found to exist at any stage of the works or after the same is complete. Subject to the limitations of this clause, the contractor shall take instructions only from the Architect / Employer.

17. The whole of the works include in the contract shall be executed by the contractor and the contractor shall not directly or indirectly transfer, assign, or under-let the contract or any part share there of or any interest therein without the prior written consent of the Employer and no undertaking shall relieve the contractor of the full and entire responsibility of the contract or from active superintendence of works during their progress.
18. No alterations, omissions or variations shall vitiate this contract, but in case the Architect thinks proper at any time during the progress of the works to make any alterations in, or additions to or omissions from, the work or any alteration in the kind or quality of materials to be use therein and shall give notice thereof in writing under his hand to the contractor, the contractor shall alter, add to, or omit from, as the case may be, in accordance with such notice, but the contractor shall not do any work extra to or make any alterations or additions to or omissions from the works or any deviations from any of the provisions of the contract, stipulation specifications or contract drawings without the previous consent in writing of the Architect and the values of such extras, alternations, additions or omissions shall in all cases be determine by the Architect with the prior approval in writing of the Employer in accordance with the provision of the contract and the same shall be added to, or deducted from the contract amount, as the case may be accordingly.
19. The Schedule of quantities, unless otherwise stated shall be deemed to have been prepared in accordance with the standard method of quantity measurement.

Any error in description or in quantity or in omission of items from the Schedule of quantities shall not vitiate this contract but shall rectified and the value thereof, as ascertained under clauses 17 hereof, shall be added to or deducted, from the contract amount (as the case may be), provided that no rectification of errors, if any, shall be allowed in the contractor's Schedule of rates.

20. The contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of this tender for the works and the prices stated in the Schedule or quantities and or the schedule of rates and prices which rates and prices shall cover all his obligations under the contract, and all matters and things necessary for the proper completion of works.
21. The Architect may from time to time intimate to the contractor and the Employer that he requires works to be measured, and the contractor shall forth with attend or send a qualified agent to assist the Architect's or the representative or the Assistant Engineer/Site Engineer/Construction Manager in taking such measurements and calculations and to furnish all the particulars or to give all assistance required by any of them.

Should the contractor not attend or neglect or omit to send such agent then the measurement taken by the Architect or a person approved by him shall be final and binding on the contractors. Such measurements detailed in the specifications.

The contractor or his representative also supply without charge the requisite number of persons with means and materials necessary for the purpose of measurements or examinations at any time and from time to time of the work or counting weighting of the materials of the materials etc.

All authorized extra works, omissions and all variations made without the Architect's knowledge, if subsequently sanctioned by him in writing (with the prior approval in writing of the Employer) shall be included in such measurement.

Site Engineer/Construction Manager will take measurement of the work jointly with the contractor and enter the same in measurement books. Based on these measurements the contractor will raise the bill as per the prescribed format. Architect to verify the bill/measurement and issue certificate stating that the work completed is as per the specifications and the measurement claimed for the works, are actually executed at site. This certificate shall be issued within 15 days after bill submission by the Contractor. Institute/Registrar upon receipt of the bill alongwith certificate of project architect shall release 75% bill amount within 10 days and balance 25% within 30 days. Please refer Annexure – A & B.

#### **Duties of Site Engineer/ Construction Manager**

- i. To make a thorough study of contract documents, Architectural/Structural drawings and other details so as to bring out ambiguities/discrepancies between them and to obtain clarification from the Competent Authority well in time to avoid delays.
- ii. To render a certificate to the Competent Authority to the effect that he has studied the contract documents, drawings and specifications.
- iii. To approve the center-line layout of building pegged out on site by the contractor and the benches for ground floor and other levels.
- iv. To take charge of objects of value and antiquity found on site or in excavations, immediately, after their discovery, to hold them in safe custody and to hand them over to the Competent Authority of the institute for further action.
- v. To approve the foundation strata when the appropriate depth of excavation is reached in consultation with the architects.
- vi. To ensure that the quality of materials and workmanship as laid down in the contract is maintained and the accuracy of dimension shown on drawings is attained in the construction.
- vii. To watch the validity of the building permission issued by the Local Authority and to ensure that the revalidation, if necessary, is obtained well in time.
- viii. To arrange periodical reconciliation of cement and steel account and ensure that proper recoveries are effected from contractor's running account bills.
- ix. To maintain the undernoted records at the site of work, in addition to normal routine requirements of an office:
  - a. Daily Progress Record
  - b. Work Site Order Book.
  - c. Instruction by the institute authorities.
  - d. Cement Statement (Receipt/Consumption/Balance).
  - e. Steel Register/any other costly Material Register.
  - f. Contract Pour Reports including Slump Test Record including electrical items.
  - g. Concrete Cube Test Register.
  - h. Test Registers of other materials/fittings, fixtures, equipments as stipulated in the tender.
  - i. Register of Drawings and Working Details.
  - j. Log Book of Defects.
  - k. The Site Engineer/Construction Manager should maintain in a Hindrance Register giving details of commencement and removal of each hindrance.
  - l. Dismantled Materials Account Register.

- m. Supply and consumption register of scarce/costly materials like bitumen, lead, laminates, special paints etc.
- n. Record of cement used/ received: Day to day record of cement used/received shall be entered in the register) and signed by the Site Engineer/Construction Manager of the institute/Architect as well as contractors representative at site.
- o. Record of reinforcement bars received at site: Necessary entry for reinforcement bars of each category shall be made in the register for steel and signed by the Site Engineer/Construction manager of the institute/Architect and the contractor daily.
- x. To study the quality of approved coarse and fine aggregate and get the design of the concrete mix in accordance with modern practice. The Site Engineer/Construction Manager shall ensure that the mix design for RCC work shall be carried out by the Architect/Structural Consultant, if applicable.
- xi. To record measurements of completed work jointly with the Contractor and to process them in running account bills.
- xii. To receive running account bills from the contractor and to forward them after checking, to the Competent Authority with his comments and recommendations and accompanied by all supporting documents.
- xiii. To submit to the Competent Authority the Progress Report fortnightly.
- xiv. To watch that the concerned contract does not lapse for want of extension of time. Therefore, to keep it alive and in operation from point of consideration that "Time is the essence of contract".
- xv. To ensure that progress on every contract is in accordance with the appropriate stage of its Time and Progress Chart.
- xvi. To prevent contractor from proceeding with any work on which the contractor has got intentions of raising claims of extra/deviated items, until the Competent Authority approves the work to continue.
- xvii. To receive the Final Bill from the contractor, to check it, and forward it with his comments and recommendations to the Competent Authority with all the supporting documents duly attached.
- xviii. To submit the final summary of costs for the project to the Competent Authority.
- xix. To submit the Competent Authority authentic information on and the undernoted records pertaining to the completed work in order to enable the Competent Authority to finalise them in the due course:
  - a) Record i.e. as completed drawings.
  - b) Record of Standard Measurements for periodical services.
  - c) Inventory of fittings and fixtures.

To hand over to the Competent Authority a "first draft" of "A Note of Comprehensive Information to the User" containing detailed instructions on how to use and maintain the completed building to the best advantage of the institute.

### **Procedure for measurement and billing of work in progress:**

#### **1. Measurement:**

Measurements shall be recorded as per IS 1200 mode measurement and in metric system. Measurement shall be recorded in jointly in measurement sheets to be supplied by the contractor. Such measurement shall be recorded by the Engineer-in-charge or Institute authorities and not by contractor. Recorded Measurement Sheets shall be kept in the custody of the Registrar's official procedure for bill would be as under.

Site engineer/Construction Manager from the institute or appointed by the Project Architects shall act as from clients side who will record all measurement and prepare bills. After finalisation of all quantities and amount, contractors would be furnished details for preparing bills on his letter pad. Such bills along with measurement sheets in soft as well as hard copy will be submitted to Project Architects office for issuing payment certificate. This exercise has to be done at site on regular basis right from the submission of Ist R/A Bill. Based on this payment certificate Registrar will honour the bill by releasing 75% of the payment within 15 days after issuing of payment certificate by Project Architects. Balance 25% payment shall be released after thorough checking of the bills by the institute within 30 days.

The minimum value of the bill shall be Rs.50.00 lakhs (Rupees Fifty Lakhs only per month).

#### **2. Running Account Payments to be regarded as Advances:**

All running account payments shall be regarded as payments by way of part payment/running against the final payment only and not as payments for work actually done and completed and accepted and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or reerected or be considered as an admission of the due performance of the contract, or any part thereof, in this respect, or the accruing of any claim, nor shall it conclude, determine or effect in any way the powers of the owner under these conditions or any of them as to the powers of the owner under these conditions or any of them as to the final settlement and adjustment of the accounts or otherwise, or in any other way vary/affect the contract. The final bill shall be submitted by the contractor within two months of the date fixed for completion of the work, other wise the Architect/Engineer-in-charge's certificate of the measurement and of the total amount payable for the work accordingly shall be final and binding on all parties.

From each running bill 8% value of the work certified shall be as retention amount. 50% of the retention amount will be released to the contractor on issuing completion certificate and the balance 50% fourteen days after the end of defects liability period.

### **3. Completion Certificate**

#### **Application for completion certificate:**

The Architect/Engineer-In-Charge shall normally issue to the contractor the completion certificate within one month after receiving, an application thereof from the contractor and after verifying from the completion documents and satisfying himself that the work has been completed in accordance with and as set out in the construction and erection drawing and contract documents.

The contractor, after obtaining the completion certificate, is eligible to present the final bill for the work executed by him under the terms of contract.

#### **Completion Certificate**

Within one month of the completion of the work in all respects, the Contractor shall be furnished with a certificate by the Architect/Engineer-In-Charge of such completion but no certificate shall be given nor shall the work be deemed to have been completed until all scaffolding, surplus materials and rubbish is cleared of the site completely. The work will not be considered as complete and taken over by the employer, until all the temporary works, labour and staff colonies etc., constructed, are removed and the works site cleared to the satisfaction of the Architect/Engineer-In-Charge.

If the Contractor shall fail to comply with the requirements of this clause on or before the date fixed for the completion of the work, the Architect/Engineer-In-Charge may at the expenses of the contractor remove such scaffolding, surplus materials and rubbish and dispose off the same as he thinks fit and clean up the site and the contractor shall for the with pay the employer for all expenses so incurred and shall have no claim in respect of any such scaffolding or surplus materials as aforesaid except of any sum actually realized by the sale thereof.

#### **Incentives**

For an early completion of the contract before the stipulated date of completion or such later dated authorized by the owner, incentive shall be payable to the contractor @ 0.5% of the contract value per week of early completion, subject to a maximum of 05% of contract price.

**CERTIFICATE**

It is certified that various items of works claimed in the ..... RA Bill by Contractor ..... have been completed in accordance with and fully confirming to the standard and/or prescribed specifications. As net amount of Rs..... (Rupees .....) is recommended to be paid to the contractor making the total upto            date            payment            of            Rs..... (Rs. ....)

Quality and rates verified. The material supplied and work done confirm with the tender specifications.

**SITE ENGINEER**

**ON LETTER HEAD OF CONTRACTOR**

..... Running Bill No. ....		
Tender Amount		Rs. ....
Value of work done		Rs. ....
Less rebate	( - )	Rs. .... _____
Net Value of work done		Rs. ....
Extra variation items after settlement @100%		Rs. ....
Extra variation items without settlement @75%		Rs. .... _____
	Total	Rs. .... _____
Add : Cost of material on site @ 75%		Rs. .... _____
	Total payable	Rs. ....
<b><u>Deductions</u></b>		
1. Retention money	Rs. ....	
2. Recovery of advance if any	Rs. ....	
3. Income-tax	Rs. ....	
4. Total bill paid till last bill	Rs. .... _____	_____
Total deductions	Rs. ....	Rs. .... _____
	Net payable	Rs. .... _____
Amount certified for payment		Rs. ....

**Note :** This page shall be signed and stamped by the Site Engineer, Contractor and Project Architect.

**ACCOUNT OF SECURED ADVANCE IF ADMISSIBLE ON  
MATERIALS HELD AT SITE BY THE CONTRACTOR**

Sno.	Name	Quantity	Unit	Amount	Remarks
1	2	3	4	5	6
Face value of Materials at site					
Secured Advance ..... % of above value.					

Date .....

.....  
Signature of Site Engineer  
Preparing the bill.

Date .....

Signature of Owner's representative

**Date .....**

**Signature of the Contractor**

**PROFORMA OF RUNNING BILL**

I	Name of the Contractor / Agency		:					
II	Name of the Work		:					
III	Sr.No. of the Bill		:					
IV	Sr.No. of the Previous Bill		:					
V	Reference to Agreement No.		:					
VI	Date of written order to commence		:					
VII	Date of Completion as per Agreement		:					
VIII	Date of Measurements		:					
XI	Present status of work		:					
SNo	Items of Description	Unit	Rate	As per Qty.	Tender Amount Rs.	UPTO Qty.	R.A. Bills Amount Rs.	

**Note :**

1. If part rate is allowed for any item, it should be indicate with reasons for the allowing such a rate.
  2. If adhoc payment is made, it should be mentioned specially.
  3. Consumption of Cement/Steel statement material consumption statement to be submitted with each R.A. Bills.
  4. Electrical R/A Bills to be supported with a certificate from the electrical supervisor for the electrical portion of work for safety and charging of the installations.
22. The contractor may, when authorized, and shall, when directed in written by the Architects with the approval of the Employer, add to, omit from, or vary the works shown upon the drawings, or included in the schedule of quantities, but contractor shall make no addition, omission or variation without such authorisation or direction. A verbal authority or direction by the Architect shall, if confirmed by them in written within seven days, be deemed to have been given in writing.
- (a) (i) The net rates or prices in the original tender shall determine the valuations of the extra tender shall determine the valuation of the extra work where such extra work is of similar character and executed under similar conditions as the work priced therein.
- (ii) Rates for all items, wherever possible, should be derived out of the rates given in the priced Schedule of quantities.
- (b) The net prices of the original tender shall determine the value of the items omitted, provided if omissions vary the conditions under which only remaining items of works are carried out, the prices for the same shall be valued.
- (c) Where the extra works are not of similar character and /or executed under similar conditions as aforesaid or where the omissions vary the conditions under which any remaining items of works are carried out or if the amount of the whole of the contract works or to any part thereof shall be such that in the opinion of the Architect the net rate or price contained in the

priced schedule of quantities or tender or for any item of the works involves loss or expense beyond that reasonably contemplated by the contractor or is by reason unreasonable or inapplicable, the Architect shall fix such other rate or price as in the circumstances he shall feel reasonable and proper, with the prior approval in writing of the employer.

(d) Where extra work cannot be properly measured or valued the contractor shall be allowed days work prices as the priced schedule of quantities or, if not so stated, then in accordance with the local day work rates and wages for the district; provided that in either case vouchers specifying the daily time (and if required by the Architect, the workman's name) and materials employed to be delivered for verification to the Architect, or his representative at to the Architect or his representative at or before the end of the week following that in which the work has been executed.

The measurement and valuation in respect of the contract shall be complete within the "period of final measurements" stated in the tender document.

**Unfixed materials when taken into account to be the property of the Employer.**

23. Where in any certificate (of which the contractor has received payment), the Architect has included the value of any unfixed materials intended for and /or placed on adjacent to the works, such materials shall become the property of the Employer and they shall not be removed except for use upon the works, without the written authority of the Architect/Employer. The contractor shall be liable for any loss of or damages to such materials.

**Removal of improper works.**

24. The Architect/Employer shall, during the progress of the works, have power to order in writing from time the removal from the work within such reasonable time or times as may be specified in order, of any materials which in the opinion of the Architect/Employer are not in accordance with the specifications or the instructions, the substitution of proper materials, the removal and proper re-execution of any work executed with materials or workmanship not in accordance with the drawings and specification instruction and the contractor shall forthwith carry out such order at his own cost. In case of default on the part of the contractor to carry such order, the Employer shall have the power to employ and pay other persons to carry out the same and all expenses consequent thereon, or incidental thereto, shall be deducted by the Employer from any money due or that may become due, to the contractor.  
No certificate, which may have been issued by the Architect, shall relieve the contractor from his liability in respect of unsound work of bad materials.

**Defects after completion.**

25. The contractor shall make good at his own cost and to the satisfactions of the employer all defects, shrinkage, settlements or other faults, which may appear within 12 months after completion of the work. In default the Employer may employ and pay other persons to amend and make good such damages, losses and expenses consequent thereon or incidental there to shall be made good and borne by the contractor and such damages, loss and expenses shall be recoverable from him by the Employer or may be deducted by the employer, in lieu of such amending and making good by the contractor, deduct from any cost of amending such work and in the event of the amount retained being insufficient, recover that from the contractor from the amount retained under General Instructions and special conditions together with any expenses the Employer may have incurred in connection therewith.

**Certificate of virtual completion & defects liability period.**

26. The work shall not be considered as completed until the architect has certified in writing that they have been virtually completed. The defects Liability Period shall commence from the date indicated in the virtual completion certificate issued by the Architect.

**Nominated Sub-Contractors**

27. All specialist, Merchants, Tradesmen and others executing any work of supplying and fixing any goods for which prime cost prices or provisional sums are included in the Schedule of Quantities and/or Specifications who may be nominated or selected by the Architect/Owner and hereby declared to be Sub-Contractors employed by the Contractors and are herein referred to as nominated Sub-Contractors.

No nominated Sub-Contractor shall be employed on or in connection with the works against whom the Contractor shall make reasonable objection or (save where the Architect and Contractor shall otherwise agree) who will not enter into a Contract providing:-

27.1 That the nominated Sub-Contractor shall indemnify the Contractor against the same obligations in respect of the Sub-Contract as the Contractor is under in respect of this contract.

27.2 That the nominated Sub-Contractor shall indemnify the Contractor against claims in respect of any negligence by the Sub-Contractor, his servants or agents or any misuse by him or them or any scaffolding or other plant, the property of the Contractor or under any workmen's Compensation Act in force.

28. The contractor is not authorized to submit or assign the job or part thereof on back to back transfer basis. In case of breach of these conditions, the Employer may serve a notice in writing on the contractor rescinding the contract whereupon the Security Deposit shall stand forfeited to the employer, without prejudice to his other remedies against the contractor. Central Govt./ State Govt. organization will not be allowed to sublet the work on back to back basis.

### **Other persons engaged by the Employer**

29. The employer reserves the right to execute any part of the work included in this contract by other agency or persons and contractor shall allow all reasonable facilities and use of his scaffolding for the execution of such work. The main contractor shall extend all co-operations in this regard.

### **Insurance in respect of damage to persons and property.**

30. The contractor shall be responsible for all injury to persons, animals or things, and for all structural and decorative damage to property which may arise from the operation or neglect of himself or of any nominated sub-contractor or any employee of either, whether such damage injury arises from carelessness, accident or any other cause whatever in any way connected in the carrying out of this contract. This clause shall be held to include inter alia, any damage to buildings, whether immediately adjacent or otherwise, and any damage to the roads, streets, foot-paths, bridge or ways as well as all damage caused to the building or ways as well as damage caused to the buildings and works indemnify the Employer and hold it harmless in respect of all and any expense arising from such injury or damage to persons or property as aforesaid and also in respect of any claim made in respect of injury and damage under any Act of any Legislature or otherwise and also in respect of any award of compensation or damage consequent upon such claims.

The contractor shall reinstate all damage of every sort mentioned in this clause, so as to deliver up the whole of the contract works complete and respect in every respect and so as to make good or otherwise satisfy all claims for damage to the property of third parties.

The contractor shall indemnify the Employer against all claims which may be made against the Employer by any member of the Public or third party in respect of any thing which may arise in respect of the works or in consequence thereof and shall at his own expense arrange to effect and maintain, until the virtual completion of the contract, with an approved office, a Policy of Insurance in the name of the Employer and the contractor against such risks and deposit such policies with the Employer from time to time during the currency of this contract. The contractor will also similarly indemnify the Employer of all claims which may be made upon the Employer whether under the workmen's composition Act or any other statute in force during the currency of this contract or at common law in respect of any employee of the contractor or any sub-contractor and shall at his own expense effect and maintain, until the virtual completion of the contract, with an approved office, a Policy of Insurance in the joint name of the Employer and the Contractor against such risks and deposit such policy or policies with the Employer from time to time during the currency of the contract.

The contractor shall be responsible for any liability which may be excluded from the Insurance Policies above referred to and also for all other damages to any person animal or property arising out of incidental or defective carry out of this contract. He shall also indemnify the Employer in respect of any cost, charges or expenses arising out of claims or proceeding and also in respect of any award of composition and damages arising therefrom.

The Employer shall be entitled to deduct the amount of any damage, compensation, cost, charges and expenses arising from or accruing from, or in respect of, any such claims or damage from any or all sums due or to become due to the contractor without prejudice to the Employer's other rights in respect thereof.

## **Fire Insurance**

**31. (a)** The Contractor shall, within fourteen days from the date of commencement of works, insure the works at his cost and keep them insured until the virtual completion if the works, against loss or damage by fire with an office to be approved by the Architect in the joint name of the Employer and the Contractor (the name of the former being placed first in the policy), for the contract amount only. The Contractor shall deposit the policy and receipts for the premises with the owner within thirty days from the commencement of the works, unless otherwise instructed by commencement of the works, unless otherwise instructed by the Architect. In default of the Contractor insuring as provided above, the Employer or the Architect on his behalf, may so insure the works and may deduct the premium paid from any money due or may become due to the Contractor without prejudice to the other rights of the Employer in respect of such default. In case it becomes necessary to suspend the works, the Contractor shall as soon as the claim under the policy is settled, or work reinstated by the Insurance office should they elect to do so, proceed with all due diligence with the completion of the works in the same manner as though the incident had not occurred and in all respects under the same conditions of the Contract. The contractor in case of rebuilding or reinstatement after fire, shall be entitled to such extension of time for completion as the Architect deemed fit.

**(b)** The amount so due as aforesaid shall be the total value of the works duly executed and of the contract and of the contract materials and goods delivered upon the site for use in works and including the date of the date not more than seven days prior to the date of the said Certificate less the amount to be retained by the Employer (as hereinafter provided) and less any installments previously paid under this clause. Provided the such Certificate shall only include the value of the materials and goods as and from time to time as they are reasonably, properly and not prematurely brought upon the site and then only if properly stored and/or protected against weather.

The Contractors will have to take out following Insurance Policies:

- 1) All Risks Insurance Policy to cover-  
Earthquake- Fire & Shock  
Landslide/Rockslide/Subsidence.  
Flood/Inundations.  
Storm/Tempest/Hurricanes/Typhoon /Cyclone Collapse.  
Theft/Burglary.  
Damage to material brought at Site and to be subsequently used in the work.
- 2) Third party Insurance Policy
  - a. For accidental loss or damage caused to the property of other persons.
  - b. For fatal or non-fatal injury to any person other than insured own employees or work men of employees of the owner of the works any other construction work thereon, or member of the Insured's family or of any of the aforesaid; directly consequent upon of solely due to the construction of any property described in the Schedule.
  - c. Limit of indemnity in respect of any one of the accidents or series of accidents arising out of one event, the amount is Rs.3,00,000.00
- 3) Workmen's Compensation Insurance.

**32.** The Contractor shall be allowed admittance to the Site on the "Date of Commencement" stated in the Appendix hereto, or such later date as may be specified by the Architect and he shall there up on and forthwith begin the works and shall regularly proceed with and complete the same (except the painting or other decorative works the Architect may desire to delay) on or before the "Date of Commencement" stated in the Appendix subject nevertheless to the provision foreextension of time hereinafter contained.

33. If the Contractor fails to complete the works by the date stated in the Appendix or within any extended time of under the clause 28 hereof and the Architect certifies in writing that in his opinion, the same ought reasonably to have been completed, the Contractor shall pay the Employer the sum named in the Appendix as "Liquidated Damages" for the period during which the said works shall so remain incomplete and the employer may deduct such damages from any moneys due to the Contractor.
34. If in the opinion of the Architect the work be delayed
- (a) by force majored or (b) by reason of any exceptionally inclement weather or (c) by reason of proceedings taken or threatened by or dispute with adjoining or neighboring owners or public authorities arising otherwise than through the Contractors own default or (d) by the works and delay or the other Contractors or tradesmen engaged or nominated by the Employer or the Architect and not referred to in the Schedule of Quantities and/or specification or (e) by reasons of the Architect's instructions (f) by reason of civil common, local combination of workmen or strike or lock-out affecting any of the building trades or (g) in consequence of the Contractor not having received in due time necessary instructions from the Architect for which he shall specifically applied in writing or (h) from other cause which the Employer may consider as beyond the control of the Contractor or (i) In the event, the value of work exceed the value of the Priced Schedule of Quantities owing to variation, the architect may with the previous approval in writing of the Employer make a fair and reasonable extension of time for the completion of the Contract works; in case of such strike or lockout, the Contractor shall as soon as may be, give written notice thereof to the Architect, but the Contractor shall nevertheless constantly use his endeavor to prevent delay and shall nevertheless constantly use his endeavor to required to the satisfaction of the Architect/Employer to proceed with the work.
35. If the Contractor after receipt of written notice from the Architects requiring compliance within ten days fails to comply with such further drawings and/or Architect's instructions, the employer may employ and pay other persons to execute any such work whatsoever it may be necessary to give effect thereto, and all costs incurred in connection therewith shall be recoverable form the Contractor by the Employer on the Certificate of the Architect as a debt or may be deducted by him from any moneys due to the Contractor.
36. If the Contractor being a individual or a Firm, commits any "act of insolvency" or shall be adjudged an Insolvent or being an Incorporate company, shall have an order for supervision of the court and the official Assignee or the Liquidator in such acts of insolvency and winding up, as the case may be, shall be unable within seven days after notice to him requiring him to do so, to show the reasonable satisfaction of the Architect that he is able to carry out and fulfill the Contract and to give security therefore, of so required by the Architect.

Or if the Contractor (whether an individual, Firm or Incorporated Company) shall suffer execution or other process of court attaching property to be issued to the Contractor.

Or shall suffer any payment under this Contract to be attached by or on behalf of any of the creditors of the Contractors.

Or shall assign or sublet this Contract without the consent in writing of the Employers first obtained.

Or shall charge or encumber this Contract or any payment due or which may become due to the Contractor hereunder.

Or if in the opinion of the Employer that the hereunder.

- a. Has abandoned the Contract, or
- b. Has failed to commence the works, or has without any lawful excuse under these conditions suspended the progress of the works for fourteen days after receiving form the Architect notice to proceed, or
- c. Has failed to proceed with the works with such due diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon, or
- d. Has failed to remove materials from the Site or to pull down and replace work for seven days after receiving form the architect written notice that the said materials or work were condemned and rejected by the Architect under these conditions or,
- e. Has neglected or failed persistently to observe and perform all or any of the acts, matters or things by this Contract to be observed and performed by the contractor to observe or perform the same.

Then and in any of the said cases the Employer may, notwithstanding any previous waiver, after giving seven days notice in writing to the Contractor, determined the Contract but without there by affecting the powers of the Architect/Employer or obligations or liabilities of the Contractor has not been so determined, and as if the work subsequently executed had been executed by or on behalf pf the Contractor, And further, the Employer by his agent or servants may enter upon and take possession of the work and all plant, tools, scaffoldings, shed, machinery, steam and other power utensils and materials lying upon the premises or on the adjoining land or roads and use the same as his own property or may employ the same by means of his own servants and workmen in carrying on and completing the works or by the employing any other contractor or person to completing or finishing or using the materials and plant for the work. When the work shall be completed or as soon as thereafter as convenient the Architect shall give a notice to the Contractor to remove his surplus materials and plant, and should the Contractor fail to do so within the period of fourteen days after receipt thereof by him, the Employer may sell the same by public auction, and give credit to the Contractor for the net amount realized. The Employer shall have been put to in procuring the works to be completed and the amount, if any, owing to the Contractor and the amount, which shall thereupon be paid by the employer to the Contractor or by the Contractor to the Employer.

37. The Contractor shall be paid by the Employer from time to time by installments under Interim certificates to be issued by the Architects to the Contractor on account of the works executed when in the opinion of the Architect, work for Interim Certificates (or less at the reasonable discretion of the Architect) has been executed in Accordance with this contract, subject, however, to a retention of the percentage of such value named in the appendix hereto as “retention percentage for Interim Certificate”, until the total amount retained shall reach the named in the Appendix as “Total Retention Money”, after which time the installments shall be upto the full value of the work subsequently so executed and fixed in the building. The Architect may in his discretion include the Interim Certificate, such amount, as he may consider proper on accounts of material delivered upon the site by the contractor for use in the works. And when the works have been virtually completed and the Architect shall have certified in writing that they have been complete, the contractor shall be paid by the Employer in accordance with the certificate to be issued by the Architect the sum of money named in the Appendix “Installment after virtual completion” being a part of the said Total Retention Money. And the contractor shall be entitled to the payment of the Final Balance in accordance with the Final Certificate to be unused in writing by the Architect at the expiration of the period referred to as “The Defects Liability Period” in the appendix hereto from the date of virtual completion, or as soon after the expiration of such period as the works shall be finally completed and all defects made good according to the true intent and all defects made good according to the true intent and meaning and hereof whichever shall last happen, provided always that the issue of the Architect of any certificate during the progress of the works or at or after the completion shall not relieve the contractor from his liability nor relieve the Contractor from his liability in case of fraud, dishonesty or fraudulent concealment relating to the works or materials or to any matter dealt with in the certificate, and I case of all the defects and insufficiencies in the works or materials which a reasonable examination would not have disclosed. No certificate of the Architect shall of itself be conclusive evidence that any works or materials to which it relates are in accordance with the contract, neither will the contractors have a claim for any amounts which the Architects might have certified in any interim bill and paid by the employer and which might subsequently be discovered as not payable and in this respect the Employers decision shall be final and binding.

The Architect shall have power to withhold any Certificate if the works or any parts thereof are not being carried out to his satisfaction.

The Architect may by any certificate make any correction in any previous certificate, which shall have been issued by him.

No certificate of payment shall be issued by architect if the contractor fails to insure the works and keep them insured till the issue of Virtual completion certificate.

All the interim payments shall be regarded as payments by way of advance against the final payment only and not as payments for work actually done and completed and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the contract, or any part thereof in any respect or the accruing of any claim nor shall it conclude determine or affect in any way the power of the final settlement and adjustment of the accounts or otherwise or in any other way vary or affect the contract.

#### **Settlement of Disputes by Arbitration**

38. All dispute or difference of any kind whatsoever which shall at any time arise between the parties hereto touching or concerning the works or the execution or maintenance thereof of this contract or the construction, remaining operation or effect thereof of this contract or the construction, remaining operation or effect thereof or to the rights or liabilities of the parties or arising out of or in relation thereto whether during or after determination, foreclosure or breach of this contract (other than those in respect of which the decision of any person is by the contract expressed to be final and binding) shall after written notice by either party to the contract to the other of them and to the appointing authority. Hereinafter mentioned be referred for adjudication to a sole arbitrator to be appointed as hereinafter provided.

For the purpose of appointing the sole Arbitrator referred to above, the Appointing Authority will send within thirty days of receipt by him of the written notice aforesaid to the contractor, a panel of three names of persons who shall be presently unconnected with the organization for which the work is executed.

The contractor shall on receipt by him of the names as aforesaid, select any one of the persons named to be appointed as a sole Arbitrator and communicate his name to his name to the appointing authority within thirty days of receipt by of the names. The appointing authority shall thereupon without any delay appoint the said person as he sole Arbitrator, if the contractor fails to communicate such selection as provided above within the period specified, the appointing authority shall make the selection and appoint the selected person as the sole Arbitrator.

If the appointing authority fails to send the contractor the panel of three names as aforesaid within the period specified, the contractor shall send the appointing authority a panel of three names of persons who shall be unconnected with either party. The appointing authority shall on receipt by him of the names as aforesaid select any one of the persons named and appoint him as a sole Arbitrator. If the appointing authority fails to select the person and appoint him as the sole Arbitrator within 30 days or receipt by him of the panel and inform the contractor accordingly, the contractor shall be entitled to appoint one of the person from the panel as sole Arbitrator and communicate his name to the appointing authority.

If the Arbitrator so appointed is unable or unwilling to act or resign is appointing or vacate his office due to any reason whatsoever another sole Arbitrator shall be appointed as aforesaid.

The work under the contract shall, however continue during the Arbitration proceeding and no payment due or payable to the contractor shall be withheld on account of such proceedings.

The Arbitrator shall be deemed to have entered on the reference on the date he issued notice to both the parties fixing the date of the first hearing.

The Arbitrator may from time to time, with consent of the parties, enlarge the time for making and publishing the Award.

The Arbitrator shall give a separate award in respect of each dispute in accordance with the terms of the contract and give a reasoned award. The venue of arbitration in his sole discretion.

It is also a term of the contract that if contractor's do/does not make any demand for arbitration in respect of any claims/Architects that the bill after due verification is passed for payment of a lesser amount, or otherwise, the contractor's right under this agreement to refer to arbitration shall be deemed to have been forfeited and Clients/Architects shall be relieved and discharged of their liability under this agreement in respect of such claim(s). Further, it is agreed that for the purpose of this clause, such notice is deemed to have been received by the contractor(s) within 2 days of posting of the letter by Clients/Architects or when delivered by hand immediately after receipt thereof by the contractor's, whichever is earlier. Further a letter signed by the officials of Clients/Architects that the letter was so posted to the Contractor's shall be conclusive.

The Fees, if any, of the Arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of the parties. The costs of the reference and of the award including the fees, if any, of the arbitrator who may direct to and by whom and in what manner, such costs or any part thereof shall be paid and may fix or settle the amount of costs to be paid.

The award of the Arbitrator shall be final and binding on both the parties.

Subject to aforesaid, the provisions of the Arbitration Act, 1940, or any statutory modification or re-enactment thereof and the rules made there under, and for the time being in force, shall apply to the arbitration proceeding under this clause.

**Right of technical scrutiny of final bill.**

39. The Employer shall have right to cause a technical examination of the works and the final bill of the works and the final bill of the contractor including all supporting vouchers, abstracts, etc., to be made at the time of payment of the final bill. If as a result of this examination or otherwise any sum is found to have been overpaid or over certified, it shall be lawful for the Employer to recover the sum.

The subject work will be scrutinised by the Chief Technical Examiner's Office, a technical wing of Central Vigilance Commission and other Vigilance and Audit Authorities of the institute. Decision of this Authority shall be binding on the contractor. Any discrepancy noted/defected shall be rectified by the contractor free of cost or appropriate amount will be recovered from the contractor's payment.

**Employer entitled to recover compensation paid to work men.**

40. If, for any reason, the Employer is obliged, by the virtue of the provisions of the workmen's compensation Act, 1923, or any statutory modification or re-enactment thereof to pay compensation to a workman employed by the contractor in execution of the works, the Employer shall be entitled to recover from the contractor the amount of compensation so paid, and without prejudice to the rights of the employer under said Act. The workman shall be at liberty to receive such amount or any part thereof by deduction of it from the security deposit or from any sum due to the contractor and upon his giving to the Employer full security to the satisfaction of the Employer for all costs for which the Employer might become liable in consequence of contesting such claim.

**Abandonment of works.**

41. If at any time after the acceptance of the Tender, the Employer shall for any reasons whatsoever not require the whole or any part of the works to be carried out, the Architect shall give notice in writing to the contractor who 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 whole works.

**Return of surplus materials.**

42. Notwithstanding anything to the contrary contained in any or all the clauses of this contract, where any material for the execution of the contract is procured with the assistance of the Employer by purchase made under orders or permits or licenses issued by the Government, the contractor shall hold the said materials economically and solely for the purpose of the contract and not dispose them without the prior written permission of the Employer and return it to the Employer, if required by the Employer, at the price to be determined by the Architect having due regard to the condition of the materials, the price to be determined not to exceed the purchase price thereof inclusive of Sales Tax, Octroi Duty and other such levies paid by the contractor in respect thereof. In event of the breach of the aforesaid condition, the contractor shall, in addition to being liable to action for contravention of the terms of license or permit and /or criminal breach of trust, be liable to Employer for all such moneys, advantage or profits resulting or which in the usual course would have resulted to him by reason of such breach.

**Right of Employer to terminate contract in event death of contractor if individual.**

43. Without prejudice to any of the rights or remedies under this contract, if the contractor, being an individual dies, the Employer shall have the option of terminating the contract without incurring any liability for such termination.

The acceptance of tender will rest with the Employer. The Employer, however does not bind himself to accept the lowest, and reserves to himself the authority to reject any or all the tenders received without assigning any reason whatsoever. The whole work may be split up between two or more contractors or accepted in part and not in full if considered expedient by the Employer and the tenderer will have no claim for revision of rates or other conditions if his tender is accepted in parts.

Tenders in which any of the particulars and prescribed information are missing or are incomplete in any respect and or the prescribed condition are not fulfilled are liable to be rejected.

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

Tenderers containing uncalled for remarks or any additional conditions are liable to be rejected.

## Marginal Notes.

44. The marginal notes and in the catch lines hereto and in the annexes are meant only for convenience of reference and shall not in any way be taken into account in the interpretation of these presents and the annexure hereto.

## Escalation

45. The rate quoted shall be firm throughout the tenure of the contract (including extension of time, if any, granted) and will not be subject to any fluctuation due to increase in cost of materials, labour, sales tax, Cess, octroi, etc., unless specifically provided in these documents variation clause enclosed in the tender

In anywhere there is discrepancy with CVC guidelines current and future, The CVC guideline and Govt./NIT regulation will have precedence

## Price variation adjustment (PVA) clause

If the prices of materials and/or wages of labour required for execution of the work increase/or decrease, the price variation adjustment (PVA) shall be worked out as per provisions detailed below and the amount of the contract shall accordingly be varied, subject to the other condition that compensation for escalation in prices shall be available only for the work periods for which the contract is validly extended under the provision of relevant clause of the contract.

In partial modification of (any) provisions made elsewhere in this Manual (contract) regarding rate quoted in a tender being not subject to any variations, price adjustment to the value of work payable to the contractor at tendered rates shall be made towards variation in the prices of materials and labour supplied by the contractor in the manner specified hereinunder:

If, after the written order to commence the work and during the operative period of this contract including any authorized extensions of the original stipulated completion period –

- a) There be any variation in the consumer price index – general index – for industrial workers (Base 1982 = 100) (source data published from time to time in Indian Labour Journal by the Labour Bureau, Government of India.)
- b) There be any variation in the All India Wholesale Price Index for all commodities (Base 1981-1982 = 100) (as published from time to time in the RBI Bulletin based on the data issued by the office of the Economic Adviser to the Government of India).

Price Variation Adjustment (PVA) towards (1) labour component and (2) material component for all materials other than steel shall be calculated in accordance with the formulae (A) and (B) respectively, given below, subject to stipulations hereinafter mentioned.

Formula (A) for labour

$$VL = \left[ \frac{0.87 P \times K_1}{100} - S \right] \times \frac{C_1 - C_0}{C_0}$$

Formula (B) for materials –

$$VM = \left[ \frac{0.87 P \times K_2}{100} - C - S \right] \times \frac{I_1 - I_0}{I_0} \text{ where}$$

VL = Amount of Price Variation Adjustment – increase or decrease in rupee due to Labour Component. Formula (A) for labour.

**VM** = Amount of Price Variation Adjustment – increase or decrease in rupees on account of materials component.

**P** = Cost of Work done during the period under consideration (bill period) as per Gross amount of bill excluding, cost of extra or substituted items, rates of which are fixed on prevalent market rates and advances on materials and/or adjustments thereof; if any.

**C** = Cost of material if any, like cement, steel etc. which are either arranged or supplied at actual or fixed rates and consumed in the work done during the period under consideration.

**S** = Cost of services like power or water supply, hire charges of machinery etc., which are supplied at fixed rates by the chart to the contractor.

**Note** – This is generally nil in case of department work.

**K<sub>1</sub>** = Percentage of labour component as calculated, as indicated in Note (1) below.

**K<sub>2</sub>** = Percentage of materials component as indicated in Note (2) below.

**C<sub>0</sub>** = Consumer Price Index – General Index Number for industrial workers (Base 2007= 100) referred to at (a) above, ruling on the last date for receipt of tenders, and as applicable to the center, nearest to the place of work, for which the index is published.

**C<sub>1</sub>** = Average of above mentioned consumer price index number during the period under consideration (bill period).

**I<sub>0</sub>** = All India Wholesale Price Index Number for all commodities referred to at (b) above, rulings on the last date for receipt of tenders and as applicable to the center, nearest, to the place of work for which the index is published.

**I<sub>1</sub>** = Average of above mentioned monthly All India Wholesale Price Index Numbers during the period under consideration (bill period).

**Note (1): K<sub>1</sub>** shall be taken as under :-

2a. Component of work : Civil work including ancillary works and external and R.C.C./tanks, septic tank etc., if any, for sanitary and plumbing work.	30%
2b. Sanitary and plumbing works including fittings and fixtures (internal work only)	20%
2c. Electrical installations work including fittings and fixtures (external and internal works)	20%

**Note (2) :K<sub>2</sub>** shall be taken as under :-

a. Civil work including ancillary works as detailed under Note (1) (a) above	70%
b. Sanitary and plumbing works including fittings and fixtures as detailed under Note (1) above	80%
c. Electrical installation work including fittings and fixtures as detailed under Note (1)(c) above	80%

#### **Stipulations:**

PVA clause is operative either way i.e. the variations in above referred price indicates are on the plus side, PVA shall be payable to the contractor and if they are on the negative side PVA shall be recoverable form the contractor, for the respective bill period of occurrence of fluctuations.

The rates quoted by the contractor shall be treated as firm for the value of work required to be done in the first 24 months of the contract period from the date of written order to commence work, and no PVA is admissible on the same on any grounds whatsoever. The value of work required to be done during the first 24 months of the contract period shall be taken as 80% of the value of work to be done on pro-rate basis in 24 months as compared to the total stipulated completion period. No PVA is admissible on the value of work required to be done in the first 24 months as worked out above, even if this work is actually done in a period longer than 24 months due to genuine reasons which are beyond his control, such period of delay will be deducted from 24 months, and the value of work to be done will be 80% of the prorata value of work to be done in such reduced period on prorata basis.

**a.** For works where the original stipulated period of completion is not more than 24 months no PVA whatsoever is permissible under this clause. However, if the period of completion is delayed beyond 24 months on account of genuine reasons which are beyond the control of the contractor, PVA will be admissible on the value of work done only in excess of value of work required to be done on a prorata basis in the first 24 months minus the period of such genuine delay.

For purpose of admissibility of PVA all the cumulative period of extensions granted for reasons which are solely attributable to the contractor is excluded from the total extended period of the contract and PVA shall not be admissible on the value of work done during such period of extensions, which are granted for keeping the contract, but only due to reason for which the contractor was solely responsible. Periods of extensions granted on account of genuine reasons which are not attributable to the contractor and which are beyond his control will, however, be included in the period for which PVA is admissible.

Not with standing anything to the contrary mentioned in any other clause/clauses of the contract, extensions of the contract period shall be granted by the Architect only with prior approval of the Director, NIT,Rourkela. Extensions granted by the Architect without Director's prior approval shall not bind the institute of payment of PVA for work done in the concerned period of extension.

**a)** Where the total cost of work done beyond the value of work required to be done in the first 24 months does not exceed Rs. 50 lakhs the total amount of PVA worked out the basis of provisions of foregoing stipulations will be limited to an upper ceiling of 10% of such value of work done in excess of value of work required to be done in the first 24 months, minus the cost of cement and steel and any other materials and services issued/arranged by the institute at fixed price i.e.  $P - (C + S)$  (terms being as per definitions given under formulae A and B above).

**b)** Where the total value of work done beyond then value of work required to be done in the first 24 months exceeds Rs. 50 lakhs the PVA on the first Rs. 50 lakhs will be calculated as provided for in the foregoing para and for the balance value of work done for which PVA will not have the upper ceiling of 10% but it ill be worked out at a lower rate i.e., at 90% of the amount worked out as per the formula A and B referred to earlier.

In working out the amount of PVA as per all the foregoing stipulations, value of such extra items or such portions of extra items the rates of which are derived from the prevailing market rates of materials and labour will not be included in the value of work done. Value of only such extra items or from tendered rates will be included in the value of work on which PVA is calculated.

For claiming the payment for PVA the contractor shall keep such books of accounts and other documents, vouchers, receipts etc., as may be required by the institute/Architect, for verification of the increased claims for reductions, to be made as the case may be and he shall also allow inspection of books, documents by the Site Engineer/Construction Manager and/or other duly authorized representative of the institute/Architects and furnish such information as may be require or called for to enable verification of the claim within a week of such request.

The contractor is required to submit to the institute, through the Architect, his claims for PVA separately for each running bill for the individual bill period for the works paid to him by the institute. He will also be required to submit detailed calculations in support of the claims.

No claim will be entertained from the contractor for interest or any other grounds for non-payment or for any delay in payment of PVA due to late publication or non-availability of the necessary price indices or due to delay in preparation of the running of final bills.

The increase/or decrease in statutory measures such as taxes, levies etc. will be considered while working out the adjustments, in accordance with Formula (B).

In all cases of disputes under this clause the decision of the Competent Authority who shall give a reasonable hearing to the contractor in person (not through Agents/Advocates) shall be final and binding.

### **Revision of Wages in a Statutory Act like the Minimum Wages Act**

If the minimum wage of a category of labour employed in the works has been increased by more than 10% due to statutory enactment and the contractor has to actually increase the wage accordingly, the actual increase may be reimbursed to the contractor after subtracting from it the portion already paid/payable as per General PVA adjustment formula due to cost index variation for the labour component. In other words, if the actual increase is “E”, the amount payable will be

$$E \left[ \frac{1 - C_1 - C_0}{C_0} \right]$$

for the period under consideration (refer the General PVA formula for abbreviation) and the increase will pertain to all labours thus affected and employed on the Muster duly checked by the institute.

### **Idle Labour**

- 46 Whatever the reasons may be no claim for idle labour additional establishment cost of hire and labour charges of tools and plants would be entertained under any circumstances.

### **Office accommodation for Site Engineer/Construction Manager**

- 47 The contractor shall provide, erect, and maintain at his cost a separate simple watertight office accommodation for the Site engineer/Construction Manager to facilitate day to day functioning of site supervision and construction management of the project. This accommodation shall be well lighted and ventilated and provided with windows, door with lock, also having toilet, pantry drinking water cooler etc. The site engineer's office shall be minimum of 300 Sq.Ft. and the contractor shall provide desk, chairs, drawers, for keeping drawing setup board having proper lock and a tack board for displaying drawings. In addition to above contractor shall provide a conference hall of minimum 250 sq.ft area equipped with centre table and number of required chairs to hold meetings at site. Contractor shall also install and maintain at his own expenses telephone and fax machine at the site for his own use and for the use of Architect besides providing Architect's office (for their site engineer) well equipped with a P4 onwards computer loaded with Auto Cad, MS Office, Prima ware and other software's and A3 size coloured printer for efficient co-ordination at site.

**APPENDIX HEREIN BEFORE REFERRED TO**

Clause		
1	Defect Liability Period	Twelve months.
2	Period of Final Measurement	Three months.
3	Date of Commencement	14 <sup>th</sup> days from the date of issue of works order, or the date site is handed over whichever is later.
4	Completion period	24 months for the entire construction.
5	Liquidated damages	Shall be 0.5% of contract amount per week of delay subject to maximum of 5.0 % of the contract amount.
6	Incentive	Shall be 0.5% of contract amount per week of early completion subject to maximum of 5.0% of the contract amount.
7	Value of works for Interim Certificates	Rs.50,00,000.00 minimum (Rs. Fifty Lacs) excluding secured advance against materials.
8	Retention Percentage per bill	8%
9	Total retention money	10%
10	Installment after virtual completion	50% of total retention money, Earnest money, & security deposit.
11	Period for honouring certificate of payment,	Interim certificate upto 75% of amount certified by the Architect within 15 days and balance 25% amount within 30 days from the date of certificate issued by the Architect.  Final Certificate – Three months.

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**Employer**

**Contractor**

## **SAFETY CODE**

### **1. Scaffolds**

Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration work which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made either of good quality wood or steel. The steps shall have a minimum width of 450 mm and a maximum rise of 300 mm. Suitable hand holds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper than  $\frac{1}{4}$  to ( $\frac{1}{4}$  horizontal and 1 vertical).

Scaffolding or staging more than 4 m. above the ground floor, swung or suspended from an overhead support or erected with with stationary support shall have a guard rail properly bolted, braced or otherwise secured, at least 1 m. above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform, gangway or stairway is more than 4 m. above ground level or floor level, they shall be closely boarded and shall have adequate width and be suitably fenced as described in (ii) above.

Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1 m.

Wherever there are open excavations in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.

Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m. in length while the width between side rails in rung ladder shall in no case, be less than 290 mm. for ladder up to and including 3 m. in length. for longer ladders this width shall be increased at least 20 mm. for each additional meter of length.

A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to construction.

(A - FIRST AID BOX -First Aid Box has to be provided by the contractor at site.)

### **2. Other Safety Measure**

All personnel of the contractor working within the plant site shall be provided with safety helmets. All welders shall wear welding goggles while doing welding work and all metal workers shall be provided with safety gloves. Persons employed on metal cutting and grinding shall wear safety glasses.

Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.

### **3. Excavation & Trenching**

All trenches, 1.25 m. or more in depth shall at all times be supplied with at least one ladder for each 30 m. in length or fraction thereof. The ladder shall be extended from bottoms of the trench to at least 1 m. above the surface of the ground. Sides of trenches which are 1.5 m. or more in depth shall be stepped back to give suitable slopes or securely held by timber bracing so as to avoid the danger of sides of collapsing. The excavated materials shall not be placed within 1.5 m. of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.

The contractor shall take all measure on the site of the work to protect the public from accidents and shall be bound to bear the expenses of defence of every suit, action or other proceedings at law that may be brought by any persons for injury sustained owing to neglect of the above precautions and to pay any such persons or which may with the consent of the contractor, be paid to compromise any claim by any such person.

#### **4. Demolition**

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

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

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

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

#### **5. Personal Safety Equipments**

All necessary personal safety equipment as considered adequate by the Engineer should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, the contractor should take adequate steps to ensure proper use of equipment by those concerned.

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

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

Those engaged in welding works shall be provided with welder's protective eyesight lids.

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

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

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

No paint containing lead or lead products shall be used except in the form of paste or ready made paint. Paints like vinyl and epoxies having toxic fumes should be applied after following all precautions laid down by manufactures.

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

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

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

## **Electrical Safety :**

All switches/equipments to be properly connected & earthed and to be checked by electrical supervisor and certified for safe use. A record to be kept all such equipments to be use e.g. welding machine, hoist etc.

## **6. Hoisting Machines**

Use of hoisting machines and tackle including their attachments anchorage and supports shall confirm to the following standards or conditions:

These shall be of good mechanical constructions sound material and adequate strength and free from patent defect and shall be kept in good repair and in good working order.

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

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

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

In case of departmental machines, the safe working load shall be notified by the Engineer. As regards contractor's machines, the contractor shall notify the safe working load of the machine to the Engineer Whenever he brings any machinery to site of work and get verified by the Engineer concerned.

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

All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use.

Adequate washing facilities should be provided at or near places of work.

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

To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer, Engineer of the institute or their representatives.

Display of danger board sign near switch is to be ensured by the contractor.

The contractor shall be responsible for all damages, losses etc due to fire or otherwise if i.e. is due to his negligence on proper operation and maintenance of his part of installations.

## ADDITIONAL CONDITIONS

The scope of work covers execution and completion of the foundations and super structure of the proposed Construction of Buildings National Institute of Technology at Rourkela -769008(Orissa) in accordance with drawings and specifications prepared by and under direction and to the satisfaction of the Employer/Director, National Institute of Technology at Rourkela -769008(Orissa) and the Architect.

**Contract :**The form of contract shall be according to the printed form “Conditions of contract”. The following clauses shall be considered as and extension and not in limitation of the obligation of the contractor.

**Drawing :**Two copies of all drawings, the schedule of quantities and specification shall be furnished by the Architect to the contractor for his own use until the completion of the contract, and shall be accessible at all reasonable time to the Architects or their representatives.

All important drawings are to be mounted on boards and placed in racks and indexed.

**Dimensions :**Figured dimensions are in all cases to be accepted in preference to scale sizes. Large-scale details take precedence over small-scale drawings. In case of discrepancy the contractor is to ask for clarification before proceeding with the work.

1. **Contractor to inspect Site :**The contractor shall visit and examine the construction site and satisfy himself as to the nature of the existing roads or other means of communications, the character of the soil and the excavation , the extent of magnitude of the work and facilities for obtaining material and shall obtain generally his own information on all matters affecting the execution of the work. No extra charge made in consequence of any misunderstanding or incorrect information on any of these points or on grounds of insufficient description will be allowed. All expenses incurred by the contractor in connection with obtaining information for submitting this including his visits to the site or efforts in compiling the tender shall be borne by the Tenderer and no claim for reimbursement thereof shall be entertained.
2. **Access to Site :**The contractor is to include in his rates for forming access to the Site with all temporary roads gangways required for the works.
3. **Setting out :**The contractor shall set out the building in accordance with the plans. All grid/centre lines shall be pegged out to satisfaction of the Architects. The contractor shall be responsible for the correctness of the lining out and any inaccuracies are to be rectified at his own expenses. He will be responsible for taking ground levels of the Site before setting out and recording them without any extra charge.

The contractor shall construct and maintain proper benches at the intersection of all main walls, columns, etc., in order that the lines and levels may be accurately checked at all times.

4. **Treasure Trove :**Should any treasure, fossils, minerals, or works of art of antiquarial interest be found during excavation or while carrying out the works, the contractor shall give immediate notice to the Architects of any such discovery and shall make over such finds to the Employer.
5. **Access for Inspection :** The contractor is to provide at all items during the progress of the works and the maintenance period proper means of access, with ladders, gangways, etc., and the necessary attendance to move and adopt as directed for the inspection of measurement of the work by the Architects or their representatives.
6. **Attendance upon all Traders :** The general contractor shall be required to attend on all the Tradesman or Sub-contractor/contractors appointed by the Employer for Water-Supply & Sanitary, Electrical installation, Air-conditioning, Security Equipment, Hardware, Telephone and other special contractors. The rates quoted shall be inclusive of attendance and also allow the contractors and retain until such times the relevant Sub-contract works are completed.
7. **Gate-Keeper and Watchmen :**The contractor from the times of being placed in possession of the Site must make arrangements for watching lighting and protecting the work, all materials, workmen and the public by day and night on all days including Sundays and holidays at his own cost.

8. **Sheds for materials :** The contractor shall provide for all necessary sheds of adequate dimensions for shortage and protection of materials like cement, lime, timber, and such other materials including tools and equipments which are likely to deteriorate by the action of sun, wind, rain or other natural causes due to exposure in the open..

All such sheds shall be cleared away and the whole area left in good order on completion of the contract to the satisfaction of the Architects.

All materials which are stored on the site such as bricks, aggregate, etc. shall be stacked in such a manner as to facilitate rapid and easy checking of quantum of such materials.

9. **Cost of transporting :**The contractor shall allow in his cost for all transporting, unloading stacking and storing or supplies of goods and materials for this work on the site and in the places approved from time by the Architects. The contractor shall allow in his price for transport of all materials controlled or otherwise to the site.

10. **W.C and Sanitary accommodation and office Assessors and accommodation:** The Contractor shall provide at his own cost and expense adequate closet and sanitary accommodation complying in every respect to the rules and regulations in force of the local authorities and other public bodies, for his workmen of nominated sub-contractors and other contractors working in the building, the assistant engineer and other employer's agent connected with this building project and maintain the same in good working order.

The Contractor shall also provide at his own expense adequate office and shall maintain the same in a satisfactory condition and shall provide light, fan and attendant, etc... for the same and shall remove them after completion of works. He shall arrange to supply at his own expense, office furniture with drawing assessors for the official use of the assistance engineer and at all times maintain in good working order a dumpy level and a Theodolite at Site, to enable the Assistant Engineer to check the lines and levels of work.

11. **Materials, Workmanship & Samples :**Materials shall be of approved quality and the best of their kind available and shall generally conform to I.S. Specifications, The Contractor shall order all the materials required for the execution of work as early as necessary and ensure that such materials are on site well ahead of requirement for use in the work. The work-involved calls for high standard of workmanship combined with speed and to the entire satisfaction of the Architects.

12. **Rates for Non-Tender Items :**Rates of items not included in Schedule of Quantities shall be settled by the Architects as mentioned in the variation clause of the Contract Conditions.

13. **Rate to include:** The rates quoted shall be for all heights and depths and for finished work. To ascertain from contractors for other trades.

The contractor shall ascertain from other contractors as directed by the Architects all particulars relating to their work with regard to the order of its execution and the position in which cases, holes and similar items will be required, before the work is taken in hand as no claims for extras will be allowed for cutting away work already executed in consequence of any neglect by the contractors to ascertain these particulars beforehand.

Before ordering materials, the contractors shall get the samples approved from the Architects well in time.

14. **Testing of work and material:** The contractors will have to carryout testing of the material at regular interval to proof quality, soundness and efficiency of the material. Expenditure required to works testing and transportations shall be borne to be contractor. All Electrical materials are to be purchased from the approved list of manufacturers or from the authorized stockist/agent of the manufacturer and a proof of such purchases made are to be submitted and a record to be kept for authenticity and quality assurance.

All the test should be as under:

**LIST OF MANDATORY TESTS**

MATERIALS	TEST	TEST PROCEDURE	MINIMUM QUANTITY	FREQUENCY
1	2	3	4	5
Lime	Chemical and Physical Properties of lime	IS-6932	15 Mt.	10 mt or part thereof
Sand	a) Silt Content	Field	40 Cu.M.	40 Cu.M.or part thereof 50 Cu.M.
	b) Bulking	Field	40 Cu.M.	40 Cu.M.or part thereof 50 Cu.M.
	c) Particle size distribution	Field	80 Cu.M.	Every Cu.M. required in R.C.C. Work
Stone Aggregate	Particle size distribution		135 Cu.M.	Every 135 Cu.M. or part thereof for R.C.C. work. For rest of work as desired.
Cement	Setting time strength soundness	IS-269 and other applicable I.S.		Every batch of Consignment and as directed wherever there is a change of source.
Cement Concrete or R.C.C.	1. Slump			Once a day or as desired.
	2. Cube strength		20 Cu.M.in slab beams & connected columns 5 Cu.m. in column.	Every 20 Cu.M. of a days concrete.
Bricks	1. Water absorption & Efflorescence		Designation-35	One test for each source of manufacture.
	2. Compressive strength		Designation-35	1,00,000 or part thereof. Two test for 1 <sup>st</sup> lot of 1,00,000& One test later for every 2,00,000 & part thereof.
Timber	Moisture		1 Cu.M.	Every three Cu.M. & part thereof.
Aluminum doors or Windows fitting	Thickness of anodic coating	IS-5523	Rs.5000.00	Rs. 10000 or part thereof.
Mortice Locks	Testing of springs		50 os.	100 or part thereof.
Steel	a) Tensile strength	IS-1529	Every Consignment	Every 20 Tonne or part thereof.
	b) Bend strength		-----do-----	-----do-----
Marble/Mosaic/Terrazo Tiles	1) Transverse strength	IS-1237	10000 tiles	10000 tiles or part thereof
	2) Water absorption	-----do-----	-----do-----	-----do-----
	3) Abrasion test	-----do-----	-----do-----	-----do-----
White glazed tiles	1) Water absorption	IS_777	10000 tiles	10000 tiles or part thereof
	2) Cracking		-----do-----	-----do-----
	3) Impact		-----do-----	-----do-----
Flush door	1) End Immersion		IS-2202	Destructive tests nos No. of shutters
	2) Knife			No. of shutters
	3) Adhesion		22-65	1
			66-100	2
			101-180	2
			181-300	3
			301-500	4
			501-above	5

- Cost of testing and transport will be borne by contractors.
- Any other materials will be tested by contractors at his own cost as per the instruction of contractors at his own cost as per the instruction of Consultants and institute from time to time.
- Frequency stated above is minimum and the Contractor may have to test materials with any frequency or as instructed by Employer/Architects without any cost.

If after any such test the work or portion of works is found in the opinion of the Architect to be defective or unsound, the contractor shall pull down and re-do the same at his own cost. Defective materials shall immediately be removed from the site.

**15. Mechanical Plant :** Besides the provisions made in clause no.4 of the conditions of contract, the contractor will be required to provide and maintain in working order the following power-driven equipments during the constructions work :-

1. A batch mix plant for Design mix concrete as per specifications shall be provided by the contractor.
2. Devices to lift up materials to the highest level of the building of the capacity in R.C.C. beams, columns and partition wall and surface type vibrators shall be maintained on the site of work.
3. Pumps for bailing out water.
4. Any other machinery ordered by the Architects.

**16. Foremen and Tradesmen :**All tradesmen shall be experienced men properly equipped with suitable tools for carrying out the work of carpentry and joinery and other specialist trades in a first class manner and where the Architects deemed necessary , the contractor shall provide any such tools, special or ordinary which are considered necessary for carrying out the work in a proper manner.

All such tradesmen shall work under an experienced and properly trained foremen, who shall be capable of reading and understanding all drawings, pertaining to this work. Electrical tradesmen should possess electrical license and a supervisor nominated should possess supervisory license. The contractor shall also comply with other conditions set out in Clause 9 of the conditions of the contract.

**17. Work Program/Weekly progress report :**The contractor shall prepare and submit to Architects for approval, a bar chart showing the program of construction of various items in detail, fitted within the period stipulated for completion, within 15 days of the communication of the acceptance of the tender. The contractor shall also furnish necessary particulars to the assistance engineer for compiling weekly progress reports in the form furnished by the Architects.

**18. Clearing of Site:** The contractor shall after completion of the work clear the site of all the debris and left over materials at his own expense to the entire satisfaction of the Architects and Municipal or other public authorities.

**19.** The Contractor shall at his own expense supply to the Architects with triplicates copies of large photographs not less than 25 cm. x 20 cm. (10" x 8") of the works taken from two approved portions of each buildings, at intervals of not more than one month during the progress of the work, or at every important stage of construction.

Preparation of building for occupation and use on completion:

**20.** The whole of the work shall be thoroughly inspected by the contractor and all deficiencies and defects put right. On completion of such inspection, the contractor shall inform the Architects in writing, that he has finished the work and it is ready for the Architects inspection.

On completion, the contractor shall clean all windows and doors and all glass panes, including cleaning of all floors, staircases and every part of the buildings including oiling of all hardware. He should also get fans etc. cleaned and ensure all light/fan and socket outlet are in working condition. He will leave the entire building neat and clean and ready for immediate occupation and to the satisfaction of the Architects.

**21. Contractor to provide etc :**The contractor shall provide a notice board on proper supports 2 m. x 1.5m (6' x 4'-6") in a position approved by the Architects. He shall allow for painting and lettering stating name of work, name of Architects, Structural consultants, general contractor and Sub-contractor. All letters except that of the name of the work shall be in letters not exceeding 5 cm. in height and all to the approval of the Architects.

**22. Vouchers :**The contractor shall furnish the Architects with vouchers on request , to prove that the materials are as specified and to indicate the rates at which the materials are purchased in orders to work out the rate analysis of the non-tender and tendered items which he may be called upon to carry thereafter.All Electrical materials are to be purchased from the approved list of manufacturers or from the authorized stockist/agent of the manufacturer and a proof of such purchases made are to be submitted and a record to be kept for authenticity and quality assurance.

**23. Protection :** The contractor shall properly cover up and protect all work through the duration of work until completion, particularly masonry, risers, moldings, steps, terrace or special floor finishes, staircases and balustrades, doors and glass, paint work and all finishing.

**Materials Specification other than indicated in the standard specification Book.**

**M.D.F. Blocks & Boards:**

M.D.F. Blocks & Boards should be of good quality and as specification under the items.

M.D.F. Boards should have I.S.I. Mark.

M.D.F. Blocks & Boards are to be stacked and used as directed by the manufacture.

While fixing hinges and fittings etc. screws should be fixed with plastic sleeve as directed by the manufacturer.

All joinery to be made as directed by the manufacturer.

Finishing to be made as directed under the item.

If it is felt necessary contractors will have to take test for the M.D.F. boards and blocks at their own cost and submit the report to the Architect's office in triplicate.

If it is required and advised by the Architect, contractor will have to give one more finishing coat of enamel paint over M.D.F. Materials without any extra charge.

**Aluminium Extrusion Sections:**

All Aluminium sections, fittings used in the work for door, windows should be powder coated aluminum (minimum thickness of powder coating 50 microns).

All Aluminium sections to be used in the work should confirm to the specifications given under the items.

All Aluminium works to be carried out in a workman like manner.

Aluminium extrusion sections used for windows shall be of approved manufacturer and shall conform to IS standards. These shall be fabricated as per the detail drawings, aluminum fabrication works shall give anodized film of 50 micron powder coated finished.

Contractor shall take care to stack fabricated frames and materials on Site under cover.

They shall be handled with care and stacked on edge on level bears and supports evenly.

Before erection the frames coming in contact with concrete or masonry plaster shall be coated with a coat of Zinc Chromate.

The rates quoted for these items shall include supplying and fixing all fittings and fixtures required for proper and safe operation.

**Granite :**Granite stone slabs are to be used should be of approved any colour and shade and of required thickness. Should be properly cut with electric machine and all exposed edges to be polished.

It should be of required lengths widths. No un-necessary joints to be provided. Wherever it is required it should of full length and width as shown on drawing or as directed.

Granite stone joints in the sink are to the sealed with approved chemical either epoxy base or resin base adhesive. All exposed edges of Granite stone slabs are to be polished.

**G.I. Pipes Concealed :** All G.I. Pipes canceled should be covered with impregnated bit mastic Hessian cloth properly overlapped and fixed in position with nails, hooks or clamps etc.

All concealed pipe work to be tested before they are covered with finishing material, if any leakages are observed then it is contractors responsibility to remove leakages and make good the surface at their own cost. Contractor will have to obtain certificate from the Site Engineer for checking the concealed pipes and testing the same.

**Cast Iron Anti-symphonies Pipes:**Cast Iron Anti-symphonies Pipes shall cost without ISI Mark of approved make. Rate quoted for this item shall include charges for making holes and making good the same.

**Cast Iron Soil Water, Waste Water Pipes, Nahani Traps :** All joints to be provided lead caulked joints as per the specification given in the Standard specification book.

**Waterproofing Treatment :**The Contractor shall carry out waterproofing treatment of terraces, toilets and water retaining structures reputed firms having specialization in the line and approved by the Architect/Employer. The contractor shall also furnish full details of such treatment to the Architect and provide all information regarding effectiveness of the treatment when called upon to do so. All such treatment shall have to be guaranteed in the form of proforma given in tender for a period of Ten Years. Any defects/leakages noticed during the guarantee period shall have to be rectified free of cost by the contractor including reinstating the surface to its original condition and finish.

# **INTERNAL ELECTRICAL WORKS**

## **TECHNICAL SPECIFICATIONS**

### **1. WIRING**

#### **1. GENERAL**

Technical Specifications in this section cover the Internal Wiring Installations comprising of:

- Wiring for lights and convenience socket outlets etc. in concealed/surface conduit/raceways.
- Wiring for telephone outlets.
- Sub main wiring.
- Conduiting for Low Voltage System

#### **2. STANDARDS AND CODES**

Latest upto date Indian Standard (IS) and Code of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and / or IEC Standard shall be applicable.

#### **3. CONDUITS**

##### **3.1 STEEL CONDUITS**

These shall be of mild steel 16 gauge upto 32mm and 14 gauge for sizes above 32mm, electric resistance welded (ERW), electric threaded type having perfectly circular tubing. Conduits shall be precession welded ERW and shall be fabricated from tested steel strips of thickness as per IS by high frequency induction weld process. Weld shall be smooth and of consistent of high quality to ensure crack proof bending. The conduits shall be black enamel painted inside and outside in its manufactured form. Wherever so specified, the conduit shall be galvanized. All conduits used in this work shall be ISI embossed.

##### **3.2 MS CONDUITS**

The electrical wiring shall be done in recessed MS Conduits, unless mentioned otherwise.

No conduit less than 25mm in diameter shall be used, unless otherwise specifically ask by Engineer-In-Charge.

##### **3.3 PVC CONDUITS (IF REQUIRED)**

Wiring shall be carried out in recessed /surface PVC conduits. The PVC conduits conform to latest and shall be ISI embossed. The conduits shall be heavy gauge (minimum 2 mm wall thickness) and the interiors of the conduits shall be free from all obstructions. All joints in conduits shall be sealed / cemented with approved solvent cement. Damage conduits/fittings shall not be used. Cut ends of conduits shall not have sharp edges.

##### **3.4 BENDS**

As far as possible, the conduit system shall be so laid out that it shall obviate use of tees, elbows and sharp bends. No length of conduit shall have more than the equivalent of two quarter bends from inlet to outlet.

### 3.5 CONDUIT ACCESSORIES

#### 3.5.1 STANDARD ACCESSORIES

The conduit wiring system shall be complete in all respects, including their accessories. Bends, couplers etc. shall be solid type in recessed type of works and may be solid or inspection type as required, in surface type of works. The accessories shall conform in all respects to the relevant IS. Samples shall be got approved by Engineer-In-Charge before use.

#### 3.5.2 FABRICATED ACCESSORIES

Wherever required, outlet/junction boxes of required sizes shall be fabricated from 1.6 mm thick MS sheets excepting ceiling fan outlet boxes which shall be fabricated from minimum 3 mm thick sheets. The outlet boxes shall be of approved quality, finish and manufacture. Suitable means of fixing connectors etc., if required, shall be provided in the boxes. The boxes shall be protected from rust by zinc phosphate primer process. Boxes shall be finished with minimum 2 coats of enamel paint of approved colour. A screwed brass stud shall be provided in all boxes as earthing terminal.

## 4. WIRES

Wiring shall be carried out with FRLS insulated 660/1100 volt grade unsheathed single core wires with electrolytic annealed stranded copper (unless otherwise stated) conductors conforming to latest IS Code. All wire rolls shall be ISI marked. All wires shall bear manufacturer's label and shall be brought to site in new and original packages. Manufacturer's certificate, certifying that wires brought to site are of their manufacture shall be furnished as required.

## 5. COAXIAL CABLES

The coaxial cables shall be of video band type with operation up to 300 MHz capability. Aging resistance shall comply with latest code i.e. maximum 5% increase in attenuation at 200 MHz measured by artificial aging (14 days at 80o C) cables shall meet all exceed following specifications

Center core Dia	0.8 mm
Diaelectric Dia	4.8 mm
Dielectric	PE
Outer Conductor Dia	5.4 mm
Outer Dia	7.0 mm
Bending radius	more than 30 mm
Impedance	75 ohms
DC Resistance	50 ohms/KM
Screening factor	more than 50
Attenuation	
50 MHz	6.5
100 MHz	9
200 MHz	13
300 MHz	16

## 6. LAYING OF CONDUITS

- Conduits shall be laid either recessed in walls and ceilings or on surface on walls and ceilings or partly recessed and partly on surface, as required.
- Same rate shall apply for recessed and surface Conduiting in this contract.
- Stranded copper conductor insulated wire of size as per schedule of quantities shall be provided in entire Conduiting for loop earthing.
- GI wire of suitable size to serve as a fish wire shall be left in all conduit runs to facilitate drawing of wires after completion of Conduiting.

## 6.1 RECESSED CONDUITING

Conduits recessed in concrete members shall be laid before casting, in the upper portion of slabs or otherwise as may be instructed, so as to embed the entire run of conduits and ceiling outlet boxes with a cover of minimum 12 mm concrete. Conduits shall be adequately tied to the reinforcement to prevent displacement during casting at intervals of maximum 1 meter. No reinforcement bars shall be cut to fix the conduits. Suitable flexible joints shall be provided at all locations where conduits cross expansion joints in the building.

Conduits recessed in brick work shall be laid in chases to be cut by electrical Contractor in brick work before plastering. The chases shall be cut by a chase cutting electric machine. The chases shall be of sufficient width to accommodate the required number of conduits and of sufficient depth to permit full thickness of plaster over conduits. The conduits shall be secured in the chase by means of heavy duty pressed steel clamps screwed to MS flat strip saddles at intervals of maximum 1 meter. The chases shall then be filled with cement and coarse sand mortar (1:3) and properly cured by watering.

Entire recessed conduit work in concrete members and in brick work shall be carried out in close coordination with progress of civil works. Conduits in concrete members shall be laid before casting and conduits in brick work shall be laid before plastering. Should it become necessary to embed conduits in already cast concrete members, suitable chase shall be cut in concrete for the purpose. For minimizing this cutting, conduits of lesser diameter than 25 mm and outlet boxes of lesser depth than 50 mm could be used by the Contractor for such extensions only after obtaining specific approval from Engineer-In-Charge. For embedding conduits in finished and plastered brick work, the chase would have to be made in the finished brick work. After fixing conduit in chases, chases shall be made good in most workmanlike manner to match with the original finish.

Cutting chases in finished concrete or finished plastered brick work for recessing conduits and outlet boxes etc shall be done by the Contractors without any extra cost.

## 6.2 SURFACE CONDUITING

Wherever so desired, conduit shall be laid in surface over finished concrete and/or plastered brickwork. Suitable spacer saddles of approved make and finish shall be fixed to the finished structural surface along the conduit route at intervals not exceeding 600 mm. Holes in concrete or brick work for fixing the saddles shall be made neatly by electric drills using masonry drill bits. Conduits shall be fixed on the saddles by means of good quality heavy duty MS clamps screwed to the saddles by counter sunk screws. Neat appearance and good workmanship of surface Conduiting work is of particular importance. The entire conduit work shall be in absolute line and plumb.

### 6.3 FIXING OF CONDUIT FITTINGS AND ACCESSORIES

For concealed Conduiting work, the fittings and accessories shall be completely embedded in walls/ceilings leaving top surface flush with finished wall/ceiling surface in a workman like manner.

Loop earthing wire shall be connected to a screwed earth stud inside outlet boxes to make an effective contact with the metal body.

### 6.4 PAINTING AND COLOUR CODING OF CONDUITS

Before laying, conduits shall be painted specially at such places where paint has been damaged due to vice or wrench grip or any other reason.

If so specified, surface conduits shall be provided with 20 mm wide and 100 mm long colour coding strips as below

Use	Code colour
Low voltage	Grey
Telephone	Black
Earthing system	Green
Control system lighting	Purple

### 6.5 PROTECTION OF CONDUITS

To safeguard against filling up with mortar/plaster etc. all the outlet and switch boxes shall be provided with temporary covers and plugs which shall be replaced by sheet/plate covers as required. All screwed and socket joints shall be made fully water tight with white lead paste.

### 6.6 CLEANING OF CONDUIT RUNS

The entire conduit system including outlets and boxes shall be thoroughly cleaned after completion of erection and before drawing in of cables.

### 6.7 PROTECTION AGAINST DAMPNESS

All outlets in conduit system shall be properly drain and ventilated to minimize chances of condensation/sweating.

### 6.8 EXPANSION JOINTS

When crossing through expansion joints in buildings, the conduit sections across the joint shall be through approved quality heavy duty metal flexible conduits of the same size as the rigid conduit. The expansion joint crossing shall be done as approved by Engineer-In-Charge.

### 6.9 LOOP EARTHING

Loop earthing shall be provided by means of insulated stranded copper conductor wires of sizes as per Schedule of Quantity laid alongwith wiring inside conduits for all wiring outlets and sub-mains. Earthing terminals shall be provided inside all switch boxes, outlet boxes and draw boxes etc.

## 7. LAYING AND DRAWING OF WIRES

### 7.1 BUNCHING OF WIRES

Wires carrying current shall be so bunched in conduits that the outgoing and return wires are drawn into the same conduit. Wires originating from two different phases shall not be run in the same conduit.

### 7.2 DRAWING OF WIRES

The drawing of wires shall be done with due regard to the following precautions:-

No wire shall be drawn into any conduit, until all work of any nature, that may cause injury to wire is completed. Burrs in cut conduits shall be smoothen before erection of conduits. Care shall be taken in pulling the wires so that no damage occurs to the insulation of the wire. Approved type bushes shall be provided at conduit terminations.

Before the wires are drawn into the conduits, conduits shall be thoroughly cleaned of moisture, dust, dirt or any other obstruction by forcing compressed air through the conduits if necessary.

While drawing insulated wires into the conduits, care shall be taken to avoid scratches and kinks which cause breakage of conductors.

There shall be no sharp bends.

The Contractor shall, after wiring is completed, provide a blank metal/sunmica plate on all switch / outlet / junction boxes for security and to ensure that wires are not stolen till switches / outlets etc. are fixed at no extra cost the contractor shall be responsible to ensure that wires and loop earthing conductors are not broken and stolen. In the event of the wire been partly / fully stolen, the contractor shall replace the entire wiring alongwith loop earthing at no extra cost. No joint of any nature whatsoever shall be permitted in wiring and loop earthing.

### 7.3 TERMINATION /JOINTING OF WIRES

Sub-circuit wiring shall be carried out in looping system. Joints shall be made only at distribution board terminals, switches/buzzers and at ceiling roses/connectors/lamp holders terminals for lights/fans/socket outlets. No joints shall be made inside conduits or junction/draw/inspection boxes.

Switches controlling lights, fans or socket outlets shall be connected in the phase wire of the final sub circuit only. Switches shall never be connected in the neutral wire.

Wiring conductors shall be continuous from outlet to outlet. Joints where unavoidable, due to any special reason shall be made by approved connectors. Specific prior permission from Engineer-In-Charge in writing shall be obtained before making such joint.

Insulation shall be shaved off for a length of 15 mm at the end of wire like sharpening of a pencil and it shall not be removed by cutting it square or wringing.

Strands of wires shall not be cut for connecting terminals. All strands of wires shall be twisted round at the end before connection.

Conductors having nominal cross sectional area exceeding 1.5 sq. mm shall always be provided with crimping sockets. Tinning of the strands shall be done wherever crimping sockets are not available as per instructions of the Engineer-In-Charge

All wiring shall be labeled with appropriate plastic ferrules for identification.

At all bolted terminals, brass flat washer of large area and approved steel spring washers shall be used.

Brass nuts and bolts shall be used for all connections.

The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less.

Switches controlling lights, fans, socket outlets etc. shall be connected to the phase wire of circuits only.

Only certified valid license holder wiremen shall be employed to do wiring / jointing work.

#### 7.4 LOAD BALANCING

The Contractor shall plan the load balancing of circuits in 3 phase installation and get the same approved by the Engineer-In-Charge before commencement of the work.

#### 7.5 COLOUR CODE OF CONDUCTORS

Colour code shall be maintained for the entire wiring installation - red, yellow, blue for three phases, black for neutral and green for earth.

### 8. SWITCHES AND FIXTURES

#### 8.1 SWITCHES

All 6 and 16 amps switches shall be of the modular enclosed type flush mounted 220 Volt AC of the best quality and standard or as approved by MEP/Architect/Engineer-In-Charge. The switch moving and fixed contacts shall be of silver nickel and silver graphite alloy and contact tips coated with silver. The housing of switches shall be made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material.

#### 8.2 FLUSH PLATES

Switches, receptacles and telephone system outlets in wall shall be provided with molded cover plates of shape, size and colour approved by the Engineer-In-Charge made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material, and secured to the box with counter sunk round head chromium plated brass screws. Where two or more switches are installed together, they shall be provided with one common switch cover plate as described above with notches to accommodate all switches either in one, two or three rows.

One and two gang switch cover plate, telephone outlet cover plate, 6 and 16 amps switched/unswitched plates shall have the same shape and size. Three and four gang switch cover plates shall have the same shape and size. Six and eight gang switch cover plates shall have the same shape and size. Nine and twelve switch cover plates shall have the same shape and size. Wherever five switches, seven switches, ten switches and eleven switches are to be fixed the next higher size of gang switch cover plate to be used and extra openings shall be provided with blank-off.

### 8.3 EXTERNALLY OPERATED SWITCHES

Externally operated switches, shall be of general purpose type, 250 volts of the proper size and rating and shall be provided in weather proof enclosures, complete with weather proof gasketed covers. The MCB's for all externally operated switches shall be separate and of proper rating.

### 8.4 WALL SOCKET OUTLETS

All 6/16 Amps wall socket outlets unless otherwise mentioned on the drawings shall be switched, five/six round pin and fitted with automatic linear safety shutters to ensure safety from prying fingers. Un-switched 6/16 amp wall socket outlets where called for in the drawings shall be of five/six round pin type. The socket outlets shall be made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material.

The switch and sockets shall be located in the same plate. The plates for 6 amp switched/un-switched plugs and telephone outlets shall be of the same size and shape.

All the switched and un-switched outlets shall be of the best standard.

An earth wire shall be provided along the cables feeding socket outlets for electrical appliances. The earth wire shall be connected to the earthing terminal screw inside the box. The earth terminal of the socket shall be connected to the earth terminal provided inside the box.

### 8.5 LIGHTING FIXTURES

The light fixtures and fittings shall be assembled and installed complete and ready for service, in accordance with details, drawings, manufacturer's instructions and to the satisfaction of the Engineer-In-Charge.

Wires brought out from junction boxes shall be encased in GI flexible pipes for connecting to fixtures concealed in suspended ceiling. The flexible pipes shall be provided with a check nut at the fixture end.

Pendant fixtures specified with overall lengths are subject to change and shall be checked with conditions of the job and installed as directed.

All suspended fixtures shall be mounted rigid and fixed in position in accordance with drawings, instructions and to the approval of the Engineer-In-Charge.

Fixtures shall be suspended true to alignment, plumb, level and capable of resisting all lateral and vertical forces and shall be fixed as required.

All suspended light fixtures etc. shall be provided with concealed suspension arrangement in the concrete slab/roof members. It is the duty of the Contractor to make these provisions at the appropriate stage of construction.

All switch and outlet boxes shall be bonded to earth with insulated stranded copper wire as specified.

Wires shall be connected to all fixtures through connector blocks.

Flexible pipes, wherever used, shall be of make and quality approved by the Engineer-In-Charge.

## **9. MEASUREMENT AND PAYMENT OF WIRING**

Wiring for lights, fans, convenience socket outlets and telephone outlets etc. shall be measured and paid for on POINT BASIS as itemized schedule of quantities and as elaborated as below unless otherwise stated.

### **9.1 PRIMARY AND SECONDARY LIGHT POINT WIRING**

In respect of group control of lights (more than one light controlled by one switch or MCB), wiring upto the first light in the group shall be measured and paid for as a primary light point. Wiring for other lights looped in one group for switch controlled as also MCB controlled lights shall be measured and paid for as secondary light points. Primary light points for switch controlled lights shall include the cost of control switch whereas primary light points controlled by MCBs shall not include the switch cost. The cost of MCB controlling such lights shall not be included in the primary light point rate since the MCB shall be paid for in the item of DB.

The point wiring basis shall assume average wiring length and average conduiting length per point based on parameters stipulated in Para 9.2 below. The average wiring length and average conducting length forming the basis of point wiring payment, shall take the electrical layouts of the entire project into consideration. Tenderers are advised to seek clarifications, if they so desire, on this aspect before submitting their tenders. No claim for extra payment on account of electrical layouts in part or whole of the project requiring larger average wiring and conduiting length per point, whether specifically shown in tender drawings or not, shall be entertained after the award of contract.

### **9.2 PARAMETERS**

Wiring shall be carried out as per following parameters in recessed/ surface conduit system.

Only looping system of wiring shall be adopted throughout. No joints excepting at wiring terminals shall be permitted.

All accessories shall be flush type unless otherwise stated.

Lights, fans and 6 amp socket outlets shall be wired as per the item given in the Bill of Quantities.

Power circuits shall normally have maximum two/one 16 amps socket outlet unless otherwise stated. Separate circuit shall be run for each Geyser, Window/Split air conditioners and similar appliances.

Wiring rates shall include painting of conduits and other accessories as required.

Wiring rates shall include cleaning of dust, splashes of colour wash or paint from all fixtures, fans, and fittings etc. at the time of taking over of the installation.

Wiring rates shall include blanking of outlet boxes to prevent damage/pilferage of wires.

Wiring rates shall include circuit wiring from DB to first control switch & shall be done as per Bill of Quantities.

### 9.3 DEFINITIONS

#### 9.3.1 WIRING FOR LIGHTS PRIMARY LIGHT POINTS

Wiring for primary light points, as defined in Para 9.1 above, shall commence at the Distribution Board terminals and shall terminate at the ceiling rose/connector in ceiling box/lamp holder via the control switch (for switch controlled lights). Rates for primary light point wiring shall be deemed to be inclusive of the cost of entire material and labour require for completion of primary light point thus defined including:

Recessed / surface conduiting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required.

Wiring with stranded copper conductor PVC insulated 660/1000 volt grade wires including terminations etc. complete as required.

Control switch with switch box and cover plate of specified type including fixing screws, earth terminal etc. complete as required. Cost of this switch is applicable only for switch controlled points. This cost shall not be applicable for DB controlled points.

Loop earthing with insulated copper wire.

#### SECONDARY LIGHT POINTS

Secondary light points, as defined in Para 9.1 above, shall cover the cost of interconnection wiring between group controlled light fittings and shall be deemed to be inclusive of the cost of entire materials and labour required for completion of the secondary light point thus defined including

Recessed / surface conduiting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required.

Wiring with stranded copper conductor PVC insulated 660/1000 volt grade wires including terminations etc. complete as required.

Loop earthing with insulated copper wire.

#### 9.3.2 WIRING FOR CEILING FANS

Wiring for ceiling fan points shall be same as for primary light points.

#### 9.3.3 WIRING FOR EXHAUST FANS

Wiring for exhaust fan points shall be same as for primary light points and shall in addition include the cost of providing a 3/5 pin 6 amp socket outlet near the fan alongwith plug top and a 6 amp control switch at convenient location near the room entry.

#### 9.3.4 WIRING FOR CALL BELL POINTS

Wiring for call bell points shall be the same as for primary light points. A call bell switch which include in lieu of the control switch at a convenient location as required.

#### 9.3.5 WIRING FOR TELEPHONE OUTLETS

Wiring for telephone outlets points shall include the entire wiring and conduiting from the telephone tag block to the telephone outlet including the telephone outlet complete as required and as itemized in the Schedule of Quantities

#### 9.3.6 WIRING FOR TV OUTLETS

Wiring for TV outlet points shall include the entire wiring and conduiting from the central point to the TV outlet including the TV outlet complete as required and as itemized in the Schedule of Quantities

#### 9.3.7 WIRING FOR CONVENIENCE SOCKET OUTLETS

3/5 pin 6 amps and 3/6 pin 16 amps single phase switched convenience socket outlets shall be provided in the building as indicated in the layout drawings.

#### 9.3.8 SUB MAINS WIRING

Sub mains wiring shall be measured from outer end of the boxes. Extra Loop length shall be left at each end as required.

### 10. ROUTINE AND COMPLETION TESTS

#### 10.1 INSTALLATION COMPLETION TESTS

At the completion of the work, the entire installation shall be subject to the following tests:

1. Wiring continuity test
2. Insulation resistance test
3. Earth continuity test
4. Earth resistivity test

Besides the above, any other test specified by the local authority shall also be carried out. All tested and calibrated instruments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the contractor at his own cost.

#### 10.2 WIRING CONTINUITY TEST

All wiring systems shall be tested for continuity of circuits, short circuits, and earthing after wiring is completed and before installation is energized.

#### 10.3 INSULATION RESISTANCE TEST

The insulation resistance shall be measured between earth and the whole system conductors, or any section thereof with all protection in place and all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it does not exceed 1100 volts for medium voltage circuits. Where the supply is derived from AC three phase system, the neutral pole of which is connected to earth, either

direct or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral. The insulation resistance measured as above shall not be less than 50 mega ohms divided by the number of points provided on the circuit the whole installation shall not have an insulation resistance lower than one mega ohm.

The insulation resistance shall also be measured between all conductors connected to one phase conductor of the supply and shall be carried out after removing all metallic connections between the two poles of the installation and in those circumstances the insulation shall not be less than that specified above.

The insulation resistance between the frame work of housing of power appliances and all live parts of each appliance shall not be less than that specified in the relevant Standard specification or where there is no such specification, shall not be less than half a Mega ohm or when PVC insulated cables are used for wiring 12.5 Mega ohms divided by the number of outlets. Where a whole installation is being tested a lower value than that given by the above formula subject to a minimum of 1 Mega ohms is acceptable.

#### 10.4 TESTING OF EARTH CONTINUITY PATH

The earth continuity conductor including metal conduits and metallic envelopes of cable in all cases shall be tested for electric continuity and the electrical resistance of the same alongwith the earthing lead but excluding any added resistance of earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

#### 10.5 TESTING OF POLARITY OF NON-LINKED SINGLE POLE SWITCHES

In a two wire installation a test shall be made to verify that all non-linked single pole switches have been connected to the same conductor throughout, and such conductor shall be labeled or marked for connection to an outer or phase conductor or to the non-earthed conductor of the supply. In the three or four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted to one of the outer or phase conductor of the supply. The entire electrical installation shall be subject to the final acceptance of the Engineer-In-Charge as well as the local authorities.

#### 10.6 EARTH RESISTIVITY TEST

Earth resistivity test shall be carried out in accordance with latest IS Code of Practice for earthing.

#### 10.7 PERFORMANCE

Should the above tests not comply with the limits and requirements as above the contractor shall rectify the faults until the required results are obtained. The contractor shall be responsible for providing the necessary instruments and subsidiary earths for carrying out the tests. The above tests are to be carried out by the contractor without any extra charge.

#### 10.8 TESTS AND TEST REPORTS

The Contractor shall furnish test reports and preliminary drawings for the equipment to the Engineer-In-Charge for approval before commencing supply of the equipment. The Contractor should intimate with the tender the equipment intended to be supplied with its technical particulars. Any test certificates etc., required by the local Inspectors or any other Authorities would be supplied by the Contractor without any extra charge. All test reports shall be approved by the Engineer-In-Charge prior to energizing of installation.

## **2. MEDIUM VOLTAGE DISTRIBUTION BOARDS**

### **1) GENERAL**

This section covers specification of DBs.

### **2) STANDARDS AND CODES**

The latest and amended upto date Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

### **3) MINIATURE CIRCUIT BREAKERS**

The MCB's shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz system.

The MCB's shall have a rupturing capacity of 10 KA at 0.5 p.f.

The MCB's shall have inverse time delayed thermal overload and instantaneous magnetic short circuit protection. The MCB time current characteristic shall coordinate with XLPE cable characteristic.

Type test certificates from independent authorities shall be submitted with the tender.

### **4) FINAL DISTRIBUTION BOARDS**

Final distribution boards shall be prewired type flush mounting, totally enclosed, Double door, dust and vermin proof with built in loose wire box and shall comprise of miniature circuit breakers, earth leakage circuit breakers, neutral link etc as detailed in the schedule of quantities.

The distribution equipment forming a part of the Distribution Boards shall comply with the relevant Standards and Codes of the Bureau of Indian.

The board shall be fabricated from 16 gauge CRCA sheet steel and shall have a hinged lockable spring loaded cover. All cutouts and covers shall be provided with synthetic rubber gaskets. The entire construction shall give an IP 43 (double door and four tier arrangement) degree of protection.

The bus-bar shall be of electrical grade copper having a maximum current density of 1.6 ampere per square mm and PVC insulated throughout the length. The minimum spacing between phases shall be 25 mm and between phase and earth 19 mm

Separate neutral link for each phase shall be provided.

Separate earth link for each phase shall be provided.

All the internal connections shall be with either solid copper PVC insulated or copper conductor PVC insulated wires of adequate rating.

The equipment shall be mounted on a frame work for easy removal and maintenance.

The sheet steel work shall undergo a rigorous rust proofing process, two coats of filler oxide primer and final powder coated paint finish.

All the circuits shall have an independent neutral insulated wire, one per circuit, and shall be numbered and marked as required by the Engineer-In-Charge.

A sample of the completed board is to be got approved by the Engineer-In-Charge before commencement of supply and erection.

Before commissioning, the distribution boards shall be megger tested for insulation and earth continuity.

#### **5) SHEET STEEL TREATMENT AND PAINTING**

Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognized phosphating process. The steel work shall then receive two coats of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

All sheet steel shall after metal treatment be given powder coated finish painted with two coats of approved shade on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns.

#### **6) NAME PLATES AND LABELS**

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

### **3. MOULDED CASE CIRCUIT BREAKERS**

#### **1.1 GENERAL**

Moulded case circuit breakers shall be incorporated in the switch board wherever specified. MCCB shall conform to IEC:947-II or IS:13947-II in all respects. MCCB shall be suitable for three phase 415 volts AC. Suitable discrimination shall be provided between upstream and down stream breakers in the range of 10-20 milli seconds. All MCCBs will have earth fault module (if specifically asked) and front operated. All four pole MCCB shall be suitable for three phase four wire system, with the neutral clearly identified and capable of first make last break feature.

#### **1.2 CONSTRUCTION**

The MCCB cover and case shall be made of high strength heat-resistant and flame retardant thermosetting insulating material, operating handle shall be quick make/quick break. The operating handle shall have suitable 'ON' 'OFF' and 'TRIPPED' mechanical indicators notable from outside. All MCCBs shall have a common operating handle for simultaneous operation and tripping of all the three phases. The MCCB should be suitable for disconnection and isolation with marking on front name plate.

Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be thermal-magnetic type provided on each pole and connected by a common trip bar such that tripping of any one pole operates all three poles to open simultaneously. Thermal magnetic tripping device shall have IDMT characteristics for sustained over load and short circuits. All MCCBs above 250 Amps will also have short circuit magnetic pickup level adjustment.

### 1.3 MCCBs

All MCCBs shall have variable thermal overload releases which can be adjusted at site.

Contact tips shall be made of suitable arc resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearances. All MCCBs of higher ratings above 250 Amps shall be provided with separate extended arcing contacts.

### 1.4 INTERLOCKING

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

- a) Handle interlock to prevent unnecessary manipulations of the breaker.
- b) Door interlock to prevent the door being opened when the breaker is in ON or OFF position.
- c) Defeat-interlocking device to open the door even if the breaker is in ON position.

### 1.5 BREAKING CAPACITY

The moulded case circuit breaker shall have a rated service. Short circuit breaking capacity of not less than 25 KA rms at 415 volts AC. Wherever required, higher breaking capacity breakers to meet the system short circuit fault shall be used.

### 1.6 ACCESSORIES

All the accessories like shunt, under voltage contact blocks shall be of snap fitting possible at site.

## 2 TESTING

- a) Original test certificate of the MCCB shall be furnished.
- b) Pre-commissioning tests on the switch board panel incorporating the MCCB shall be done as per standard specifications.

# EXTERNAL ELECTRICAL WORKS

## TECHNICAL SPECIFICATIONS

### **A. MV CABLES**

#### **1 STANDARDS OF CODES**

This chapter covers the specifications for supply and laying of Medium Voltage XLPE cables.

All equipments, components, materials and entire work shall be carried out in conformity with applicable and relevant Bureau of Indian Standards and Codes of Practice, as amended upto date. In addition, relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and /or IEC Standards shall be applicable.

#### **2 CABLES**

Medium voltage cables shall be aluminium conductor FR XLPE insulated, PVC sheathed armoured conforming to latest IS. Cables shall be rated for 1100 Volts.

All Conductor cables shall be as per BOQ.

Conductors shall be insulated with high quality FR XLPE base compound. A common covering (bedding) shall be applied over the laid up cores by extruded sheath of unvulcanised compound. Armouring shall be applied below outer sheath of PVC sheathing. The outer sheath shall bear the manufacturer's name and trade mark at every meter length. Cores shall be provided with following colour scheme of PVC insulation.

1 Core	:	Red/Black/Yellow/Blue
2 Cores	:	Red and Black
3 Cores	:	Red, Yellow and Blue
3 ½ /4 Core	:	Red, Yellow, Blue and Black

#### **3 STORING, HANDLING, LAYING, JOINTING AND TERMINATION**

##### **3.1 STORING**

All the cables shall be supplied in drums. On receipt of cables at site. It should be ensured that both ends of the cables are properly sealed to prevent ingress/absorption of moisture lay the insulation. The cables shall be inspected and stored in drums with flanges of the cable drum in vertical position. Whenever cable drums have to be moved over short distances, they should be rolled in the direction of the arrow, marked on the drum and while removing cables from the drums the drum shall be properly mounted on jacks or on a cable wheel or any other suitable means making sure the spindle, jack etc. are strong enough to take the weight of the drum.

##### **3.2 LAYING**

Cables shall be laid as per the specifications given below:

### 3.3 DUCT SYSTEM

Wherever specified such as road crossing, entry to building or in paved area etc. cables shall be laid in under ground ducts. The duct system shall consists of a required number of stone ware pipes, GI, CI or spun reinforced concrete pipe with simplex joints and all the jointing work shall be done according to the CPWD building specifications or as per the instructions of the Engineer-In-Charge as the case may be. The size of the pipe shall not be less than 100mm in diameter for a single cable and shall not be less than 150mm for more than one cable and so on. The pipe shall be laid directly in ground without making any special bed but wherever asbestos cement pipes are used, the pipes shall be encased in concrete of 75mm thick. The ducts shall be properly anchored to prevent any movement. The top surface of the cable ducts shall not be less than 60 cm. below the ground level. The ducts shall be laid a gradient of at least 1:300. The duct shall be provided manholes of adequate size at regular intervals for drawing the cables. The manhole cover and frame shall be of cast iron and machine finished to ensure a perfect joint. The manhole covers shall be installed flush with the ground or paved surfaces. The duct entry to the manholes shall be made leak proof with lead-wool joints. The ducts shall be properly plugged at the ends to prevent entry of water, rodents, etc. Suitable duct markers shall be placed along the run of the cable ducts. The duct markers shall at least be 15 cm. square embedded in concrete, indicating duct. Suitable cable supports made of angle iron shall be provided in the manholes for supporting the cables. Proper identification tags shall be provided for each cable in the manholes.

### 3.4 CABLES IN OUTDOOR TRENCHES

Cable shall be laid in outdoor trenches wherever called for. The depth of the trenches shall not be less than 75cm from the final ground level. The width of the trenches shall not be less than 45 cm. However, where more than one cable is laid, an axial distance of not less than 15 cm. shall be allowed between the cables. The trenches shall be excavated in reasonably straight line with vertical side walls and with uniform depth. Wherever there is a change in direction suitable curvature shall be provided complying with the requirements. Suitable shoring and propping may be done to avoid caving in of trench walls. The bottom of the trench shall be level and free from stone brick bats etc. The trench shall then be provided with a layer of clean, dry sand cushion of not less than 8 cm. in depth.

The cable shall be pulled over rollers in the trench steadily and uniformly without jerks and strains. The entire cable length shall as far as possible be paved of in one stretch. However where this is not possible the remainder of the cable may be removed by "Flaking" i.e. by making one long loop in the reverse direction. After the cable has been uncoiled and laid into the trench over the rollers, the cable shall be lifted slightly over the rollers beginning from one end by helpers standing about 10 meters. apart and drawn straight. The cable should then be taken off the rollers by additional helpers lifting the cable and then laid in a reasonably straight line.

For short cut runs and sizes upto 50 sq.mm of cables upto 1.1 KV grade any other suitable method of direct handling and laying can be adopted with the prior approval of the Engineer-in-charge.

When the cable has been properly straightened, the cores are tested for continuity and insulation resistance and the cable length then measured. The ends of all cables shall be sealed immediately. In case of PVC cables suitable moisture seal tape shall be used for this purpose.

Cable laid in trenches in a single tier formation shall have a covering of clean, dry sand of not less 17 cms above the base cushion of sand before the protective cover is laid. In the case of vertical multi tier formation after the first cable has been laid, a sand cushion of 30 cms shall be provided over the initial bed before the second tier is laid. If additional tiers are formed, each of

the subsequent tiers also shall have a sand cushion of 30 cms as stated above. The top most cable shall have final sand covering not less than 17 cms before the protective cover is laid.

Unless otherwise specified, the cables shall be protected by the second class bricks of not less 20 cms x 10 cms x 10 cms (nominal size) protection covers placed on top of the sand (bricks to be laid breadth wise) for the full length of the cable. Where more than one cable is to be laid in the same trench, this protective covering shall cover all the cables and project at 5 cm. over the sides of the end cables. The trenches shall be taken back filled with excavated earth free from stones or other sharp edge debris and shall be rammed and watered, if necessary, in successive layers not exceeding 30 cm, unless otherwise specified.

### 3.5 ROUTE MARKER

Cable route marker marked "Cable" shall be provided alongwith the route of the cable and location of loops. The route markers shall be of tapered concrete slab of 60 x 60cm at bottom and 50 x 50cm at top having a thickness of 10cm. Cable marker shall be mounted parallel to and 50cm away from the edge of the trench.

### 3.6 CABLES IN INDOOR TRENCHES

Cables shall be laid in indoor trenches wherever specified. The trench shall be made of brick masonry with smooth cement mortar finish with suitable removable covers (i.e. precasted slabs or chequered plates). The dimensions of the trenches shall be determined depending upon the maximum number of cables that is expected to be accommodated and can be conveniently laid. Cables shall be arranged in tier formation in trenches and if necessary, cables may be fixed with clamps. Suitable clamps, hooks and saddles shall be used for securing the cables in position. Spacing between the cables shall not be less than 15 cm centre to centre. Wherever specified, trenches shall be filled with fine sand and covered with RCC or steel chequered trench covers.

### 3.7 CABLE ON TRAYS/RACKS

Cable shall be laid on cable trays/racks wherever specified. Cable racks/trays shall be of ladder, trough or channel design suitable for the purpose. The nominal depth of the trays/racks shall be 150 mm. The width of the trays shall be made of steel or aluminium. The trays/racks shall be completed with end plates, tees, elbows, risers, and all necessary hardware; steel trays shall be hot dip galvanized. Cable trays shall be erected properly to present a neat and clean appearance. Suitable cleats or saddles made of aluminium strips with PVC covering shall be used for securing the cables to the cable trays. The cable trays shall comply with the following requirements :

The tray shall have suitable strength and rigidity to provide adequate support for all contained cables.

- a) It shall not present sharp edges, burrs or projections injurious to the insulation of wiring/cables.
- b) If made of metal, it shall be adequately protected against corrosion or shall be made of corrosion resistant material.
- c) It shall have side rails or equivalent structural members.
- d) It shall include fittings or other suitable means for changes in direction and elevation of runs.

### 3.8 INSTALLATION

Cable trays shall be installed as a complete system. Trays shall be supported properly from the building structure. The entire cable tray system shall be rigid.

Each run of the cable tray shall be completed before the installation of cables.

In portions where additional protection is required, non combustible covers/enclosures shall be used

Cable trays shall be exposed and accessible.

Where cables of different system are installed on the same cable tray, non combustible, solid barriers shall be used for segregating the cables.

Cable trays shall be grounded by two nos., earth continuity wires. Cable trays shall not be used as equipment grounding conductors.

#### 3.8.1 JOINTING AND TERMINATION

Cable jointing shall be done as per the recommendations of the cable manufacturer. All jointing work shall be done only by qualified/licensed cable jointer.

All jointing pits shall be of sufficient dimensions as to allow easy and comfortable working.

Jointing materials and accessories like conductor, ferrules, solder, flex, insulating and protective tapes, filling compound, jointing box etc. of right quality and correct sizes, confirming to relevant Indian Standards.

Each termination's shall be carried out using brass compression glands and cable sockets. Hydraulic crimping tool shall be used for making the end termination's. Cable gland shall be bonded to the earth by using suitable size copper wire /tape.

### 3.9 TESTING

Cable jointing shall be tested at factory as per the requirements of latest IS amendment upto date. The tests shall incorporate routine tests, type tests and acceptance tests.

Cable shall be tested at site after installation and the results shall be submitted to the Engineer-In-Charge.

Insulation resistance between conductors and neutral and conductors and earth.

Pressure test for 15 minutes.

## **B. EARTHING**

### **GENERAL**

This section covers the general arrangement of the earthing, i.e. all non-current carrying metal parts of the electrical installation shall be earthed as per latest IS code and general specifications for electrical works (part-1, internal) of CPWD specifications. All metal conduits, trunkings, cable sheaths, switchgear, distribution boards, meters, light fixtures, fans and all other metal parts forming part of the work shall be bonded together and connected by two separate and distinct conductors to earth electrodes. Earthing shall also be in conformity with the provisions of Rule 32, 61, 62, 67 and 88 of IER 1956. The earth electrode shall not be situated less than 1.5 meters.

## **EARTHING SYSTEMS**

It shall comprise of earth electrodes, earth strips, earth continuity conductor and all earthing conductors shall be of high conductivity copper, GI or aluminium and shall be protected against mechanical damage and corrosion. The size of earth conductors shall not be less than half that of the largest current carrying conductor. The connection of earth continuity conductors of earth bus and earth electrodes shall be strong and sound and shall be rigidly fixed to the walls, cable trenches, cable trays or conduits and cable by using suitable clamps made of non ferrous metals.

## **EARTHING ELECTRODES**

Earthing electrodes shall be designed as per the requirement of latest IS codes. The number and size of earth electrodes shall be calculated so that under fault conditions no electrode is loaded above its maximum permissible current density. The resistance of earth electrode shall be as low as possible, the maximum allowable value being one ohm.

Earthing electrodes of either plate type or pipe type may be adopted. The choice of plate or pipe electrode shall be decided according to the anticipated fault level of the network and local soil conditions. Generally, plate electrodes shall be used for substations and large medium voltage network and pipe electrodes for small medium voltage network and installations.

### **1.1 LOCATION OF EARTH ELECTRODES**

Normally an earth electrode shall not be situated less than 1.5 mtr from any building. Care shall be taken that the excavation for earth electrode may not affect the column footings or foundation of the buildings. In such cases electrodes may be further away from the building.

The location of the earth electrode will be such where the soil has reasonable chance of remaining moist. As far as possible, entrances, pavements and road ways, are to be definitely avoided for locating earth electrode.

### **1.2 WATER ARRANGEMENT**

Method of watering arrangement shall comply with CPWD General Specifications.

### **1.3 PLATE ELECTRODE**

Plate electrodes shall be made of GI plate of 6 mm thick and 60x60 cm. size. The plate shall be buried vertically in ground at depth of not less than 3.5 meters to the top of the plate, the plate being encased in charcoal to a thickness of 15 cm. all round. It is preferable to bury the electrode to a depth where sub-soil water is present. Earth leads to the electrode shall be laid in a GI pipe and connected to the plate electrode with GI bolts, nuts and washers. A GI pipe of not less than 19 mm Dia shall be placed vertically over the plate and terminated in a funnel at 5 cm. above ground. The funnel shall be provided with a wire mesh. The funnel shall be enclosed in masonry chamber of 100 x 50 cm. dimensions. The chamber shall be provided with CI frame cover of 100 x 50 cm size. The earth station shall also be provided with a suitable permanent identification label/tag.

Note: If copper plate is used it shall be of 3mm thickness.

1.4 Pipe electrode shall comprise of a 2.5 Meter. long 40 mm Dia GI pipe buried vertically in a pit of 35 x 35 cm size and filled with alternate layers of charcoal, salt and river sand and connected at the top to a GI pipe of 19 mm, 1 Meter. long with a funnel at the other end, 5 cm above the ground. The earth lead shall be properly fixed to the pipe electrode with brass bolts, nuts and washers. The funnel and earth lead connections shall be enclosed in a masonry chamber of 30 x 30 x 30 cm. dimensions. The chamber shall be provided with a CI frame and CI cover. Proper permanent identification tag/label shall be provided for each electrode.

## **INSTALLATION**

All joints shall be reverted and sweated. Joints in the earth bar shall be bolted and the joints faces tinned. Where the diameter of the bolt for connecting earth bar to apparatus exceeds one quarter of the width of the earth bar, the connection to the bolt shall be made with a wider piece of flange of copper jointed to earth bar. These shall be tinned at the point of connection and special care taken to ensure a permanent low resistance contact to iron or steel. All steel bolts, nuts, washers, etc shall be cadmium plated. Main earth bars shall be spaced sufficiently away from the surface to which they are fixed, such as walls or the side of trenches to allow for easy connections. Copper earth bars shall not be fixed by ferrous fittings. The earthing shall be suitably protected from mechanical injury by galvanized iron within ground shall be buried at least 60 cm deep. The earthing lead shall be securely bolted and soldered to the plate or pipe as the case may be. In the case of the plate, the lead shall be connected by means of cable socket with two bolts and nuts. All washers shall be of the same materials as the plate or pipe. All iron bolts, nuts and washers shall be galvanized.

### **1.1 METHOD OF INSTALLATION OF WATERING ARRANGEMENT**

In the case of plate earth electrode a watering pipe of 20 mm Dia of medium class GI pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided on the top for watering the pit. In case of pipe earth electrode a 40 mm x 20 mm reducer shall be used for accessing the funnel. The watering funnel attachment shall be housed in masonry enclosure of not less than 30 cm x 30 cm x 30 cm. A cast iron cover having locking arrangement shall be suitably embedded in the masonry enclosure.

## **PRECAUTIONS**

Earthing system shall be mechanically robust and the joints shall be capable of retaining low resistance even after passages of fault currents.

Joints shall be soldered, tinned and double riveted. All the joints shall be mechanically and electrically continuous and effective. Joints shall be provided against corrosion.

The earthing lead from electrode onwards shall be suitably protected from mechanical injury by a 15 mm Dia GI pipe in case of wire and by 40 mm Dia medium class GI pipe in case of strips. Portion of this protection pipe within the 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 floor to adequate depth.

## **TESTING**

On the completion of the entire installation, the following tests shall be conducted and no earth electrode shall have ohmic resistance of more than 2 ohm and in rocky soil not more than 3 ohms.

- a) Earth resistance of electrodes
- b) Impedance of earth continuity conductors as per IEE regulations.
- c) Effectiveness of earthing as per IEE regulations.

All meters, instruments and labour required for the tests shall be provided by the contractor. The test results shall be submitted in triplicate to the Architects for approval.

## **C. EXTERNAL LIGHTING**

The specification covers the supply, installation, testing and commissioning of the following items (as specified in BOQ):

- i) Street/Boundary lighting poles complete with all accessories e.g. looping box, clamps MCBs and required hardware etc.
- ii) Street/boundary lighting fixtures complete with all accessories e.g. lamps, holders, choke, upto terminal box etc.
- iii) Wiring of street light fixtures.
- iv) Cable laying, earthing and inter connection. G.I. pipes for cable entry to looping box.
- v) Foundation of poles and erection.
- vi) All the items should be tested and installed as per the latest Indian standards specifications and all the sundry items such as clamps, bolts, nuts, racks, support miscellaneous wiring etc., required to make the installation complete shall be taken care while quoting the major items.

## **STEEL TUBULAR POLE**

The poles for street lighting purpose shall be complete in all respects and shall confirm to Latest IS unless otherwise specified. All poles shall be complete with base plate of 400 mm x 400 mm x 10 mm thick welded to bottom. The poles shall be provided terminal box for looping in and looping out of cables and shall consists MCB as specified. The looping box shall be suitable for outdoor installation and complete with all hardware such as clamp, bolts, earthing studs, lockable door etc. and shall be paint also in the same manner as specified for poles. The poles shall be provided with two numbers of GI pipes of suitable Dia for cable entry as shown in drawing. The poles shall be painted with two coats of red oxide primer on both outside and the portion of the pole below the ground before erection and two coats of aluminium paint of approved shade after erection over the exposed portion.

## **ERECTION OF POLE**

While loading, transporting, unloading and erecting the poles care shall be taken so that the poles do not get bent. Out of shape and where necessary such defects shall be rectified before the poles are erected in position. The poles shall be erected in plumb line and correct level as indicated in the drawing and to the satisfaction of the Engineer-in-charge. They shall be kept in this position with the help of manila ropes until the foundation are constructed (for a minimum period of 10 days) and the back filling is complete. Foundation shall be made with reinforced cement concrete (1:2:4) and not less than 200 mm thick all round. The pole base plate shall be fixed over 150 mm thick concrete bed. Foundation shall be continued upto 300 mm or more above ground level as per location of the pole to avoid ingress of water logging etc. The foundation shall be tapered suitably into a collar. The excavated portion shall be filled back with earth and consolidated. The cement concrete foundations shall be cured properly by covering the same with water soaked or moist gunny bags at least two weeks before loading the pole.

## **ERECTION OF LIGHT FIXTURES**

Each light fixture shall be connected to the supply through MCB of a suitable rating mounted in the looping box. The fitting shall be fixed to the pole properly and securely.

## **WIRING OF LIGHT FIXTURES**

The wiring of lighting fixtures from terminal block by means of 2.5 Sq.mm PVC insulated two core copper conductor through a suitable rated MCB and neutral. Cost of two core connecting cable from junction box to lighting fixture and earth wire complete with connections are included in the quoted rate.

## **CABLING WORKS**

All cable installation work shall be done as per relevant clauses of section cable work.

## **TESTS**

Before handing over the installation, tests on all fittings and cables shall be carried out as per IS specification.

The tests shall include:

- Meggar test
- Continuity test
- Polarity test and phase sequence test

## **D. MEDIUM VOLTAGE PANELS:**

### **1. GENERAL**

Medium voltage power control centres (generally termed as switchboard panels) shall be in sheet steel clad cubicle pattern, free floor standing, totally enclosed, compartmentalized design having multitier arrangement of the incomers and feeders as per details given in the schedule of quantities. All panels shall conform to the requirements of the latest addition of IS and shall be suitable for 415 V, 3 phase AC supply or 230 V single phase AC supply as required.

### **2. CONSTRUCTIONAL FEATURES**

The Switch Boards shall be totally enclosed, sheet steel cubicle pattern, extensible on side, dead front, floor mounting type (wall mounting if specifically asked for in BOQ) and shall have a bus bar chamber at the top and the cable entry from the bottom. (For panel requiring top cable entries if any, refer to BOQ). The cable terminations should be in side the feeder compartment only.

The Switch Boards shall be completely dust and vermin proof. Synthetic rubber gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of ingress protection of IP 43. All doors and covers shall also be fully gasketed with synthetic rubber. All the live parts shall be properly shrouded with FRP sheets.

The Switch Board shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be constructed from CRCA sheet steel of thickness not less than 1.6 mm. Joints of any kind in sheet metal shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal. Base channel shall be fabricated from ISMC 75 and door shall be provided at the bottom with arrangement for fixing bolts in the foundation.

All panels and door covers shall be properly fitted and square with the frame. The cutouts in the panel shall be correctly positioned.

Lifting lugs of adequate strength shall be provided on each transport section of the panels.

Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of the Switch Boards.

### **3. SWITCHBOARD DIMENSIONAL LIMITATIONS**

A base channel 75 mm x 5 mm thick shall be provided at the bottom.

The overall height of the Switch Board shall be limited to 2200 mm

The height of the operating handle, push buttons etc shall be restricted between 300 mm and 1900 mm from finished floor level.

### **4. BUS BARS**

The bus bars shall be suitable for 4 wire, 415 volts, 50 Hz, system. The main bus bar shall be made of high conductivity electrolytic grade AL 91E Aluminium. The bus bars shall have uniform cross section throughout the panel. The bus bars shall be capable of carrying the rated current at 415 volts continuously. The bus bar will run in a separate bus bar chamber using bus insulators made of non-deteriorating, vermin proof, non hygroscopic materials such as epoxy fiber, reinforced polyester or moulding compound (min. 25mm clearance between phase to phase & phase to neutral bus bars shall be provided). The interval between the two insulators will be designed after considering the following:

- a) Strength and safe load rating of the insulator,
- b) The vibrating force generated during a fault,
- c) A Factor of safety of 1.25
- d) A set of insulators at both ends of the bus.

Bus bars shall be sized considering maximum current density of 1 Amps/ cross section Sq.mm area. The size of the bus bar calculations must be approved by the consultants. The bus bars shall be designed to withstand a temperature rise of 45°C above the ambient. To limit the temperature rise in the bus bar chamber a set of louvers can be provided at strategical places considering the air circulation.

All the bus bars shall be insulated with PVC heat shrinking sleeves throughout (except at joints) the length of the panel. The electro-galvanized high tensile steel nuts, bolts, plain or spring washers of suitable size will be used in connecting the various sections of the bus bars.

### **5. SWITCH BOARD INTERCONNECTIONS**

All connections between the bus bars/Breakers terminations shall be through solid Aluminium strips of adequate size to carry full rated current which shall be PVC/fiber glass insulated.

For switch unit ratings upto 63A PVC insulated copper conductor wires of adequate size to carry full load current can be used. The terminations of all such interconnections shall be properly crimped.

## **6. CABLE TERMINATIONS**

Knockout holes of appropriate size and number shall be provided in the Switch Board in conformity with the location of incoming and outgoing conduits/cables. All cable entries shall be from bottom until & unless specifically asked for in the BOQ.

The cable terminations of the circuit breakers shall be brought out to terminal cable sockets suitably located in the panel.

All outgoing links for FSU\MCB feeders shall be in the feeder compartment only.

The Switch Boards shall be complete with tinned brass cable sockets, tinned brass compression glands, gland plates, supporting clamps and brackets etc for termination of 1100 volt grade aluminium conductor PVC cables.

## **7. EARTHING**

The panels shall be provided with an aluminium earth bus of suitable size running through out the length of the switchboard. Suitable earthing eyes/bolts (at min. two points) shall be provided on the main earthing bus to connect the same to the earth grid at the site. Sufficient number of star washers shall be provided at the joints to achieve earth continuity between the panels and the sheet metal parts.

## **8. INTERLOCKING**

The panels shall be provided with the following interlocking arrangement.

The door of the switch-fuse compartments is so interlocked with the switch drive or handle that the door can be opened only if the switch is in 'OFF' position. De-interlocking arrangement shall also be provided for occasional inspection.

It shall not be possible for the breaker to be withdrawn when in 'ON' position.

It shall not be possible for the breakers to be switched on unless it is either in fully inserted positions or for testing purposes in fully isolated position.

The breaker shall be capable of being raked in to 'testing' 'isolated' and 'maintenance' positions and kept locked in any of these position.

A safety latch to ensure that the movement of the breaker as it is withdrawn, is checked before it is completely out of the cubicle shall be provided.

## **9. WIRING**

All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labeled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 sq.mm except for the circuits related to current transformers or circuits with current carrying capacity more than 5 Amps (for which min. 2.5 Sq.mm copper conductor wires shall be used).

## 10. SHEET STEEL TREATMENT AND PAINTING

Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulfuric acid and a recognized phosphating process. The steel work shall then receive two coats of oxide primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

All sheet steel shall after metal treatment shall be powder coated with shade RAL 7032 (Siemens Gray) on the outside of the panel and mounting plates shall be of orange shade. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns (shade of paint may be changed if the Engineer In charge so desires).

## 11. NAME PLATES AND LABELS

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

## 12. INSTALLATION

Installation shall be done by erection Contractor.

## 13. TESTING AND COMMISSIONING

Copies of type tests and routine test as per relevant specification, carried out at manufacturer's work shall be submitted to the ENGINEER IN CHARGE as required.

Wiring and connections including earthing shall be checked for continuity and tightness.

Insulation shall be measured with a 500 V megger and insulation resistance shall not be less than 100 Mega ohms

Interlocking operation to be checked as per requirement.

Tests shall be performed in presence of authorized representative of the ENGINEER IN CHARGE for which the contractor shall give due prior notice.

## 14. HIGH VOLTAGE TEST

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

## 15. PRE-COMMISSION TESTS:

Panels shall be commissioned only after the successful completion of the following tests. The tests shall be carried in the presence of Architect's/Consultant's or their representatives.

- All main and auxiliary bus bar connections shall be checked and tightened.
- All wiring termination and bus bar joints shall be checked and tightened.
- Wiring shall be checked to ensure that it is according to the drawing.
- All wiring shall be tested for insulation resistance by 1000 volts Meggar.
- Phase rotation tests shall be conducted
- All relays and protective devices shall be tested for correctness of settings and operation by introducing a current generator and an ammeter in the circuit.

## 16. CLIMATIC CONDITIONS

The panels & switch gear components shall be suitable for following climatic conditions:

	<u>Maximum</u>	<u>Minimum</u>
DBT	45 <sup>o</sup> C	3 <sup>o</sup> C
RH	90%	20%

## 17. HEATING ARRANGEMENT

The panel shall be provided with a thermostatically controlled heating arrangement for monsoon (200 Watt) to take care of high humidity conditions. A 6/16A service socket outlet (single phase) shall be provided in one of the compartments in all the panels.

## E. METERING, INSTRUMENTATION AND PROTECTION

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

### 1 MEASURING INSTRUMENTS

#### GENERAL

Direct reading electrical instruments shall be in conformity with IEC-51, BS: 89 or IS: 1248. The accuracy of direct reading shall be 1.0 for voltmeters and 1.5 for ammeters. Other type of instruments shall have accuracy of 1.5. The error due to variations in temperature shall be limited to a minimum. The meter shall be enclosed in a dust tight housing. The housing shall be of steel or phenolic mould. The design and manufacture of the meters shall ensure the prevention of fogging of instrument glass. Instrument meters shall be sealed in such a way that access to the measuring element and to the accessories within the case shall not be possible without removal of the seal. The meters shall be provided with white dials and black scale marking. The pointer shall be black in colour and shall have zero position adjustment device which could be operated from outside. The direction of deflection shall be from left to right. Suitable selector switches shall be provided for all ammeters and voltmeters intended to be used on three phase supply.

#### a) Ammeters

Ammeters shall be moving iron type. The moving part assembly shall be with jewel bearings. The jewel bearing shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks. The ammeters shall be manufactured and calibrated as per the latest edition of IS 1248 or BS 89. Ammeters shall be instrument transformer operated, and shall be suitable for 5 A. Secondary of instrument transformer. The scales shall be calibrated to indicate primary current, unless otherwise specified. The ammeters shall be capable of carrying sustained overloads during fault conditions without damage or loss of accuracy.

#### b) Voltmeters

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

## 2 INSTRUMENT TRANSFORMERS

### Current Transformers

Current transformers shall be in conformity with IS: 2705 (Part-I, II, & III) in all respects. All current transformers to be used in the L.T. Electrical panels shall be low tension, ring type resin cast current transformer with the requisite currents ratio having secondary of the current transformers selected will be based on the following;

1. For energy measuring: 1.0 class of accuracy.
2. For other metering: 1.5 class of accuracy.
3. For protects on: 3.0 class of accuracy. Where a common CT is used for different functions the CT accuracy class will be equal to the best class required by any of those function.

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

1. Name and make
2. Serial Number
3. Transformation ratio
4. Rated burden
5. Rated voltage
6. Accuracy class

The current transformers to be selected for this panel will have at least 20% extra VA capacity available over the normal capacity based on the following details;

1. For ammeters: 3 VA
2. For current coils of KW & KWHR, PF, and KVAR meters or for all recorders: 5 VA.
3. For normal wiring: 2 VA.
4. For current coil of protection relays: 10 VA under; no circumstances the VA rating of the CT's will be less than 15 VA.

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

## 3 CONTROL DEVICES

### a) Push Buttons

The push buttons used in the panels will be rated for more than 415 volts and 2 amps. All the push buttons will be mounted on the front door and the assembly will be in two parts. All the push buttons will be mounted on the front door of the cubicle in regular symmetrical fashion as per the general norms being practiced. Only one make of push buttons will be used in the assembly of all the panels. The selection of the colour of the push buttons will be as follows

<u>Function</u>	<u>Colour</u>
Starting/Switching ON	Green
Stopping/Switching OFF	Red
Resetting	Black
Forward ON	Yellow
Reverse ON	Blue
Emergency OFF	Red/Mushroom

#### b) Indicating Lights

The indicating lights used in the panel will be pleasant looking and round shape having the following features;

1. A separate front lens for it's easy replacement.
2. Facility to replace the bulb from the front.
3. Bayonet pin cap bulbs of standard size to be used.
4. The shape of the lens to allow viewing from sides.
5. Series resistance with use of low voltage bulb for longer life.
6. Clear and distinct indication for light ON and OFF with differences of brightness of the lens.

The selection of the colors of the indicating lamps will be as follows:

- Red for system in operation
- Amber for system ready for operation.
- Green for system being put off.
- Red, yellow and blue for incoming supply.

#### 4 TESTING

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

- a) Type tests
- b) Routine tests

Original test certificates in triplicate shall be provided.

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

- a) Suitable injection tests shall be applied to the secondary circuit of every instrument to establish the correctness of calibration and working order.
- b) All relays and protective devices shall be tested to establish correctness of setting and operation by introducing a current generator and an ammeter in the circuit.

#### F. MINIATURE CIRCUIT BREAKERS

The MCB's shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz system. MCB's shall be quick make and break type conforming to relevant IS. Housing shall be heat resistant and have high impact strength. MCB's shall be flush mounting type and shall be provided with trip free manual operating liver with ON/OFF indications

MCB's shall be provided with magnetic thermal releases for over current and short circuit protection. The overload or short circuit device shall have a common trip bar in case of DP and TPN MCB's. The MCB's shall have inverse time delayed thermal overload and instantaneous magnetic short circuit protection. The MCB time current characteristic shall coordinate with H.R.C. fuse/PVC cable characteristic.

The MCB's shall have a minimum breaking capacity of 10 kA at 230/415 volts in accordance with IEC: 898 - 1995 and IS: 8828 - 1996

## **G. MOULDED CASE CIRCUIT BREAKERS**

### **1 GENERAL**

Moulded case circuit breakers shall be incorporated in the switch board wherever specified. MCCB shall conform to IEC: 947-II or IS: 13947-II in all respects. MCCB shall be suitable for three phase 415 volts AC. Suitable discrimination shall be provided between upstream and down stream breakers in the range of 10-20 milli seconds. All MCCBs will have earth fault module (if specifically asked) and front operated. All four pole MCCB shall be suitable for three phase four wire system, with the neutral clearly identified and capable of first make last break feature.

### **2 CONSTRUCTION**

The MCCB cover and case shall be made of high strength heat-resistant and flame retardant thermosetting insulating material, operating handle shall be quick make/quick break. The operating handle shall have suitable 'ON' 'OFF' and 'TRIPPED' mechanical indicators notable from outside. All MCCBs shall have a common operating handle for simultaneous operation and tripping of all the three phases. The MCCB should be suitable for disconnection and isolation with marking on front name plate.

Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be thermal-magnetic type provided on each pole and connected by a common trip bar such that tripping of any one pole operates all three poles to open simultaneously. Thermal magnetic tripping device shall have IDMT characteristics for sustained over load and short circuits. All MCCBs above 250 Amps will also have short circuit magnetic pickup level adjustment.

All MCCBs shall have variable thermal overload releases which can be adjusted at site.

Contact tips shall be made of suitable arc resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearances. All MCCBs of higher ratings above 250 Amps shall be provided with separate extended arcing contacts.

### **INTERLOCKING**

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

Handle interlock to prevent unnecessary manipulations of the breaker.

Door interlock to prevent the door being opened when the breaker is in ON or OFF position.

Defeat-interlocking device to open the door even if the breaker is in ON position.

## BREAKING CAPACITY

The moulded case circuit breaker shall have a rated service. Short circuit breaking capacity of not less than 25 KA rms at 415 volts AC. Wherever required, higher breaking capacity breakers to meet the system short circuit fault shall be used.

## ACCESSORIES

All the accessories like shunt, under voltage contact blocks shall be of snap fitting possible at site.

## TESTING

Original test certificate of the MCCB shall be furnished.

Pre-commissioning tests on the switch board panel incorporating the MCCB shall be done as per standard specifications.

## LIGHTNING PROTECTION

### TECHNICAL SPECIFICATIONS

The lightning protection system shall be of the enhanced type which is designed to attract lightning to a preferred point and safely convey the lightning energy to ground with minimal risk of side flashing via a predetermined route.

The complete lightning protection system will comprise the following key components.

- a. Lightning ESE Air Terminal
- b. Mounting support
- c. Down conductor - HVSC
- d. Lightning Strike Recorder
- e. Advance Chemical Gel Earthing

#### **A) LIGHTNING AIR TERMINAL**

- 1) The lightning air terminal shall be an Early Streamer Emission Terminal which will respond dynamically upon leader activity in the near area.
- 2) The ESE Air terminal shall be tested and certified in accordance with the French National Standard – NF C 17-102 & as per IEC 60-1:1989, the ESE air terminal should successfully withstand minimum 4 current impulse equivalent to 150 KA (8/20 micro sec waveform)
- 3) As per NF C 17 – 102, the ESE air terminal should be tested with the “Switching Impulse Voltage” of 700 KV & “Direct Voltage” of 70 KV
- 4) The ESE lightning air terminal shall be configured as a spheroid which is comprised of separate electrically isolated panels surrounding an earthed central finial.
- 5) The insulation material used to electrically isolate the panels shall be comprised of a base polymer which provides high ozone and UV resistance with a dielectric strength of 24 – 38 KV/mm.
- 6) The external shape of the advanced lightning rod shall be such that it will limit the development of sharp point corona discharge under static thunderstorm conditions.
- 7) The central finial shall be elevated above the spheroid to a length of 90mm.
- 8) The upper section of the central finial shall be rated to withstand 200KA.
- 9) An air gap shall be provided between the individual electrically isolated panels (4 panels) and the finial tip of the central rod.
- 10) Arcing shall occur between the panel sections of the spheroid and the finial tip only upon the progression of a lightning leader.
- 11) The ESE air terminal shall have no moving parts, no electronic circuits and will have no dependence on external power supply or batteries.
- 12) Under a normal atmosphere all components of the advanced lightning terminal (ESE) shall be non corroding.
- 13) The ESE air terminal shall be insulated from all surrounding points and structure being protected.

- 14) The ESE air terminal shall be tested and certified from CPRI (Central Power Research Institute, Govt of India) with the minimum Impulse current of 45KA (8/20 micro sec) for the positive & negative impulse (5 shots each). After the test, the ESE terminal should not be found any degradation or any damage.
- 15) The ESE air terminal shall be approved from DGMS (Director General of Mines Safety) Govt of India.

#### **B) MOUNTING SUPPORT OF LIGHTNING AIR TERMINAL**

- 1) The mounting pole used to support the lightning air terminal shall be a circular insulated FRP (2 meters), Inline coupling unit and G.I mast of minimum height of 2 meters.
- 2) The mounting pole and supports shall be securely fixed with brackets and guy wires where required.
- 3) DOWN CONDUCTOR - (HIGH VOLTAGE SHIELDED CABLE)
- 4) The High Voltage Shielded Cable shall consist of a Core Filler, Stranded Copper Conductor, Insulation material, Outer Copper conductor with external conductive sheath.
- 5) The main copper conductor within the High Voltage Shielded Cable shall have a minimum cross sectional area of 50 sq.mm.
- 6) The outer diameter of the High Voltage Shielded Cable shall be less than 38mm.
- 7) The High Voltage Shielded Cable shall have a maximum inductance of 25nH/m.
- 8) The main copper conductor shall allow for direct connection to the Lightning Rod (Air Terminal) through the use of compression lug.
- 9) The High Voltage Shielded Cable shall be tested as per IEC 600601, 2<sup>nd</sup> edition, 1989-11
- 10) The High Voltage Shielded Cable shall withstand the Lightning Impulse Voltage of minimum 200KV (positive polarity) and 250 (negative polarity)
- 11) The High Voltage Shielded Cable shall be installed as per manufacturer's instructions and shall not be subjected to bends of less than 0.6 meters radius.

#### **C) LIGHTNING STRIKE RECORDER**

- 1) The Lightning systems shall be installed complete with the lightning strike recorder.
- 2) The lightning strike recorder shall contain a mechanical 6 digit display which will register all lightning discharges with a sensitivity of 1500A 8/20  $\mu$ s peak current impulse.
- 3) The lightning strike recorder shall be housed in a IP 65 rated enclosure and will operate without reliance on batteries or an external power source.
- 4) As per IEC 60-1:1989, the lightning strike recorder should withstand a maximum current impulse equivalent to 450 KA (8/20 micro sec waveform)

#### **D) ADVANCE CHEMICAL GEL EARTHING**

#### **E) EARTH ELECTRODE:**

- 1) The Electrode shall be of GI construction Dual Pipe technology.

- 2) The chemical earth electrode should have been tested in CPRI (Central Power Research Institute) for Peak & RMS current.
- 3) The Electrode shall be surrounded by resistance lowering grounding minerals to increase the overall conductive surface area in order to lower the ohmic value and also to minimize the corrosion process.
- 4) The Electrode shall be highly conductive and non-corrosive.
- 5) The Electrode should be able to carry the peak short circuit withstand current of minimum 50KA and duly tested and certified by CPRI.
- 6) Ohmic value should not be fluctuative.
- 7) Between the inner & outer pipes, it should be adequately filled with special composition of highly conductive metallic compound which will have the continuity for fast conduction & highly resistive to corrosion.

#### **F) GROUND RESISTANCE IMPROVEMENT POWDER**

- 1) The Ground Resistance Improvement Powder shall consist of a base electrolyte which when mixed with other compounds shall produce an earth gel of following properties:
- 2) A gelatinous mass within the surrounding ground soil which will not wash away.
- 3) Shall not contaminate ground water.
- 4) Shall not reduce, contract or separate from the accompanying electrode.
- 5) Shall be highly conductive and increase effective ground contact area.
- 6) Shall allow the effective dissipation of electrical surges and faults.
- 7) Shall be hygroscopic in nature and improve earth's absorbing power and humidity retention capability.
- 8) Shall decrease the resistance of the earth.
- 9) Shall be maintenance free.
- 10) Shall maintain these properties for a span of min 20 years lifetime.
- 11) Use of common salt is prohibited.
- 12) Higher doses of compound may be used depending upon site conditions for optimum results in high resistance soil or rocky areas.

## 1 CONDUITS

Conduits and Accessories shall conform to relevant Indian Standards. Wall thickness shall be 16 gauge upto 32 mm dia and 14 gauge above 32 mm dia conduit. Screwed G.I.conduits shall be used. Joints between conduits and accessories shall be securely made, to ensure earth continuity. All conduit accessories shall be threaded type only. All raw metal shall be painted with bitumastic paint.

Only approved make of conduits and accessories shall be used.

Conduits shall be delivered to the site of construction in original bundles and each length of conduit shall bear the label of the manufacturer.

Maximum permissible number of 650/1100 volt grade PVC insulated wires that may be drawn into rigid non metallic or GI Conduits are given below :

Size of wires Nominal Cross section Area (Sq. mm.)	Maximum number of wires within conduit size(mm)				
	20	25	32	40	50
1.5	5	10	14	--	--
2.5	5	8	12	--	--
4	3	7	10	--	--
6	2	5	8	--	--
10	--	3	5	6	--
16	--	2	3	--	6
25	--	--	2	4	6
35	--	--	--	3	5

**APPROVED MAKE OF ELECTRICAL ITEMS**

S. NO.	DETAILS OF EQUIPMENT/ MATERIAL	MANUFACTURERS
	ELECTRICAL WORKS	
1	SWITCH GEARS	SIEMENS / SCHNEIDER / ABB
A)	ACBs, SFU, Contactors, Aux Relay	
B)	MCCBs, 200Amp and Above	
2	MCCBs 160 Amp & below	SIEMENS / LEGRAND / ABB / SCHNEIDER
3	MCBs / RCCBs / RCBOs / DBs	SIEMENS / LEGRAND / ABB / SCHNEIDER
4	CHANGE OVER SWITCH	L&T / HAVELLS / LEGRAND / HPL
5	MOTOR STARTERS	SIEMENS / CGL / L&T
6	AC STARTERS	SIEMENS / ELECTRONIC TYPE - GETRON
7	PUSH BUTTONS	SIEMENS / L&T / ABB
8	AL. COPPER CONDUCTOR XLPE / PVC INSULATED POWER & CONTROL CABLE	POLYCAB / HAVELLS / GLOSTER / RPG / NICCO / CCI / INCAB / UNIVERSAL / FINOLEX / RR CABLE / V GUARD
9	FR AND PVC INSULATED STANDARAD FLEXIBLE COPPER WIRES AS PER IS 694	FINOLEX / ANCHOR / POLYCAB / HAVELLS / LAPP/ RR / V-GUARD/ HPL
10	PVC RIGID CONDUIT FRLS HEAVY DUTY	FINOLEX / PLAZA / HARSHA / PRECISION / AKG / BERLIA / OTHER MAKE WITH APPROVAL BUT MINIMUM THICKNESS 1.5MM FOR 20MM AND 2MM FOR 25MM AND ABOVE
11	PIANO REED TYPE SWITCHES AND ACCESSORIES	ANCHOR / HPL / CONA / RR
12	DECORATIVE SWITCH BOARD COVER WITH WHITE TOP LAMINATION	HYLAM / FORMICA / RR
13	MODULAR TYPE SWITCHS AND ACCESSORIES	LEGRAND (MOSSAIC) / CRAB TREE (ATHENA) / SIEMENS / SCHNEIDER / ANCHOR (WOOD/AVE) / MK / HPL
14	FTL / CFL LIGHT FIXTURE	PHILIPS / CGL / WIPRO
15	MH / SV STREET / FLOOD LIGHT FITTINGS, LAMPS & ACCESSORIES	BAJAJ / PHILIPS / CGL / SCHREDAR/ WIPRO
16	POST TOP / GARDEN LIGHTS	PHILIPS / CGL / SCHREDAR / WIPRO
17	HIGH MAST LIGHTS	PHILIPS / CGL / BAJAJ /SCHREDER
18	ENERGY METERS	ALSTOM / SECURE
19	MEASURING INSTRUMENTS	AE / L&T / COSMO / HPL SOCOMEE
20	CELING FANS	USHA / CGL / BAJAJ
	i) DGS & D	
	ii) ENERGY EFFECTIVE FANSS WITH 5* RATED AS PER BEE	
21	EXHAUST FANS / WALL FANS	CGL / USHA / BAJAJ / HAVELL'S

22	TUBULAR / OCTAGONAL GALVANISED / MILD STEELS POLES	ASTER / BANSAL / BAJAJ / SHREDAR
23	CT / PT	KAPPA / L&T / AE
24	PAINTS	BERGAR / ASIAN / NEROLAC
25	SELECTOR SWITCHS	KAYCEE / L&T / GE
26	GEYSERS	BAJAJ / USHA / CGL / V-GUARD / JAGUAR
27	PANELS BUILDERS	PRAGATHI CONTROLS / ELEINS SWITCHBOARDS / BALAJI ELECTRO CONTROLS / EAP / CPRI APPROVED PANEL MANUFACTURER
28	CABLE TRAY & RACEWAYS	PUSHPAK FABRICATOR / REXTON /LEGRAND
29	ELR WITH CBCT	PROKE DEVICES / VOLTAMP
30	BUS TRUNKING	C&S / SCHNEIDER / LEGRAND
31	PANELS & LTOB	SCHEIDER / SIEMENS / LEPRAND / EAP/ PRAGATHI CONTROLS / ELEINS SWITCHBOARDS / BAJAJI ELECTRO CONTROLS
32	HT XLPE CABLE	UNIVERSAL (SATNA) / POLY CAB / HAVELLS / NICCO
33	HT PANEL VCB	SCHNEIDER / ABB/ SIEMENS
34	DISTRIBUTION TRANSFORMER	AREVA / SIEMENS / POWER WARE / AEG / PETE
35	FREE LEAD ACID BATTERY	EXIDE / AMRON / TATA
36	BATTERY CHARGER	AE / VOLTSTAT / WAVE ELECTRONICS / CHLORIDE
37	CAPACITOR	SIEMENS / ABB / L&T
38	APFCR	L&T / DUCATI / MG
39	UPS	AAL / SOCOMEC / SU KAM
NOTE :. ANY OTHER ITEM AS PER APPROVAL BY CONSULTANT/ NIT. . THE ELECTRICAL ITEMS / BOUGHT OUTS SHOULD CONFORM TO ENERGY CONSERVATION BUILDING CODE 2007 / LATEST		

Note :

1. Wherever makes have not been specified for certain terms as equivalent makes referred, the same shall be as per BIS and as per approved by Engineer in charge / Consultant.
2. Contractor shall be required to get the finishing items approved in respect of their make, finish, texture and colour etc.