TENDER DOCUMENT

Name of Work: Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR

Note-1:- The intending bidder must read the terms and conditions carefully. He should submit his bid only if he considers himself eligible and he is in possession of all the documents as required.

Note-2:- The intending bidder must upload all the documents as detailed in **Para 25 on pages- 11 of** this tender document.

Note-3:- Applicants are advised to keep visiting www.iitk.ac.in/iwd/tenderhall.htm, https://eprocure.gov.in/eprocure/app & from time to time (till the deadline for bid submission) for any updates in respect of the tender documents, if any. Failure to do so shall not absolve the applicant of his liabilities to submit the applications complete in all respect including updates thereof, if any. An incomplete application may be liable for rejection.

Note-4:- The EMD shall be prepared in favour of "**The Director, IIT Kanpur" payable at Kanpur** as detailed in the tender document. The bank guarantee shall also be in favour of "**The Director, IIT Kanpur"**.

Note-5:- The defect liability period is 12 months from the date of handing over the completed and fully functional building to the engineer in charge except for the items specifically mentioned in this tender document. Other related details are elaborated in the tender document.

Note-6:- The construction work is to be carried out at IIT Kanpur campus.

Recommended by:

Abhijeet	T. Kesavdas	R. K. Verma
Assistant Executive Engineer	Executive Engineer (Electrical)	Executive Engineer (Civil)

Approved by

V. K. Tiwari
Superintending Engineer

Name of Work: Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR

This NIT amounting to Rs. 68,37,531/- contains 140 pages numbered from 01 to 140.

Superintending Engineer

INDIAN INSTITUTE OF TECHNOLOGY KANPUR
INSTITUTE WOPRKS DEPARTMENT
CENTRAL OFFICE
Notice Inviting e-Tender -47/Composite/D1/2025-26

The Superintending Engineer, IWD, IIT Kanpur on behalf of the Board of Governors of IIT Kanpur invites online percentage rate open bids on two envelope system form eligible firms / contractors in two bid system (Eligible cum Technical & Financial Bid) for the following work:

Sl No.	Name of Work	Estimated Cost (Rs.) Including GST	Earnest money	Period of completion
1	**Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR**	Civil- 59,02,535/- Electrical- 5,63,476/- HVAC- 3,71,520/- **Total-** 68,37,531/-	Rs. 1,36,751/-	**01 Month**

Last date & time of submission of bid on 06.11.2025 **upto 3.30 PM**. All details are available on website, https://eprocure.gov.in/eprocure/app www.iitk.ac.in/iwd/tenderhall.htm. The bids can only be submitted online at https://eprocure.gov.in/eprocure/app. Any corrigendum regarding this tender will be published only on above mentioned websites.

No. IWD/CO/2025-26/ 233 dated: 28.10.2025

Superintending Engineer
Phone No. 0512-259-7059

Technical BID

(Eligibility Bid)

Name of work: Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR

Note:- The intending bidder must read the terms and conditions carefully. He should only submit his bid if he considers himself eligible and he is in possession of all the documents as required.

INDIAN INSTITUTE OF TECHNOLOGY,
KANPUR INSTITUTE WORKS DEPARTMENT
Notice Inviting e-Tender

The Superintending Engineer, IWD, IIT Kanpur on behalf of Board of Governors of IIT Kanpur invites online percentage rate open bids form eligible firms/contractors of repute in two bid system (Eligible cum Technical & Financial Bid) for the following work:

1	Name of organization	:	Indian Institute of Technology, Kanpur
2	NIT No.	:	**47/Composite/D1/2025-26**
3	Location	:	Indian Institute of Technology, Kanpur
4	Tender / Quotation type (open / limited /EOI / Auction / Single	:	Open Tender
5	Tender / Quotation category (services / works	:	Works
6	Type of Contract (work / supply / auction/ service / buy / empanelment / sell	:	Works
7	Form of contract (CPWD-7/8)	:	CPWD-7
8	Work Category (civil / electrical / fleet / management / computer system	:	Composite work
9	Is multi-currency allowed?	:	No
10	Date of publishing / issue / start	:	As per CPP portal
11	Document download start date	:	As per CPP portal

12	Document download end date	:	As per CPP portal
13	Last date & time of uploading of bids	:	As per CPP portal
14	Date & time of opening of Technical bids	:	As per CPP portal
15	Bid Validity Days	:	90 days from the date of opening of technical bid
16	Earnest Money Deposit (EMD)	:	**Rs. 1,36,751/-**
17	No. of Bids / Covers (1 / 2 / 3 / 4)	:	2
18	Address for communication	:	Superintending Engineer, IWD, IIT Kanpur-208016 Contact no. 0512-259-7059
19	Email address	:	seiwd@iitk.ac.in

1. Contractors who fulfil the following requirements shall be eligible to apply. Joint ventures and Special Purpose Vehicles are not allowed to participate. Should have satisfactorily completed the works as mentioned below during the last Seven years ending previous day of last date of submission of tenders.

i. Three similar works each costing not less than Rs. **27.35** lacs

OR

ii. Two similar works each costing not less than Rs. **41.03** lacs

OR

iii. One similar work costing not less than Rs. **54.70** lacs.

AND

One complete work costing not less than Rs. **27.35** lacs with Central Government department /Central autonomous body / central public sector undertakings .

Similar work shall mean works of "Construction of RCC/Structural steel framed structure building including Internal water supply, Sanitary installation, Drainage, electrical all executed under single agreement".

Note:

1. As mentioned in the definition of similar work constructed in each work of the financial

magnitude as specified above.

(a) Should have had average annual financial turnover of Rs. **20.51 lacs** on construction works during the last three years ending 31st March 2025.

(b) Should not have incurred any loss (profit after tax should be positive) in more than two years during the last five years ending 31st March, 2025

(c) Should have Networth certificate of minimum **10% of the estimated cost put to tender** issued by a certified Chartered Accountant with UDIN.
OR
Should have a Banker's certificate of the amount equal to **40% of the estimated cost put to tender** (ECPT)**.**

(d) Should have the calculated bidding capacity equal to or more than the estimated cost of the work.

(e) The bidder should not have been barred /black-listed by the central/state government, or any entity controlled by it, from participating in any tender, and the bar subsists as on the bid due date, would not be eligible to submit the bid.

3. The intending bidder must read the terms and conditions carefully. He should submit his bid only if he considers himself eligible and he is in possession of all the documents required.
4. Information and Instructions for bidders posted on website shall form part of bid document.
5. The bid document consisting of Technical (eligibility) & the Financial bid i/c plans, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with contractor whose bid may be accepted and other necessary documents can be seen in the office of the Executive Engineer between hours of 11:00 AM and 4:00 PM **from date of publicity of tender to date of submission of tender every day** except on Saturday & Sunday and public holidays or can be seen on website www.iitk.ac.in/iwd/tenderhall.htm, https://eprocure.gov.in/eprocure/app
6. Applicant has to deposit earnest money of Rs 1,36,751**.00** in the form of receipt/ Treasury Challan or Demand Draft or Pay order or Banker 's Cheque or Deposit at Call **Receipt or Fixed Deposit Receipt (drawn in favour of "The Director IIT Kanpur") along with tender document.**
7. Earnest Money in the form of Treasury Challan or Demand Draft or Pay order or Banker's Cheque or Deposit at Call Receipt or Fixed Deposit Receipt (drawn in favour of "The Director IIT Kanpur") shall be scanned and uploaded to the e-Tendering website within the period of bid submission. **The original EMD should be deposited in the office of Executive Engineer, Civil Division-I, IWD, IIT, Kanpur** in envelop mentioning "EMD for the work" up to **08.11.2025 till 12.30 PM.**

Online technical bid documents submitted by intending bidders shall be opened only of those bidders whose original EMD deposited and other documents scanned and uploaded are found in order.

Online financial bid document submitted by the bidders shall be opened only of those bidders who on the basis of pre-qualification documents uploaded by them within the period of bid submission, qualify in accordance with the provision of technical bid. The financial bid shall be opened at the notified time, date & place in presence of qualified bidders or their representative.

8. The intending bidder must have valid class-III **digital signature** to submit the bid.
9. On opening date, the contractor can login and see the bid opening process. After opening of bids, he will receive the competitor bid sheets.
10. Contractor can upload documents in the form of **PDF** format.
11. **Certificate of Financial Turn Over :** At the time of submission of bid, contractor has to upload Affidavit/Certificate from **CA** mentioning Financial Turnover on construction work of five (5) years or for the period as specified in the bid document and further details if required may be asked from the contractor after opening of technical bids containing pre-qualification documents. The balance sheet in case of private public limited company shall include its standalone finance statement and consolidated financial statement both. There is no need to upload entire voluminous balance sheet.
12. If a tenderer does not quote any percentage above/ below on the total amount of the tender or any section/sub head in the percentage rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer.
13. The **Technical bid** shall be **opened first** on due date and time as mentioned above. The time and date of opening of financial bid of contractors qualifying the technical bid shall be communicated to them at a later date.
14. The department reserves the right to reject any prospective application without assigning any reason and to restrict the list of qualified contractors to any number deemed suitable by it, if too many bids are received satisfying the laid down criterion.
15. After submission of the bid the contractor can re-submit revised bid any number of times but before last time and date of submission of bid as notified.
16. The rates for all items of work, shall unless clearly specified otherwise, include cost of all operations and all inputs of labor, material, T&P, scaffolding at all heights irrespective of any location, wastages, watch and ward, other inputs, all incidental charges, all taxes, cess, duties, levies, etc. required for execution of the work.
17. Copy of certificate of work experience and other documents as specified in the technical bid/eligibility bid document shall be scanned and uploaded to the e-Tendering website within the period of bid submission.
18. Online technical bid documents submitted by intending bidders shall be opened only of those bidders who have deposited Earnest Money on or before the due date of opening.

19. Online financial bid document submitted by the bidders shall be opened only of those bidders who on the basis of pre-qualification documents uploaded by them within the period of bid submission, qualify in accordance with the provision of technical bid. The financial bid shall be opened at the notified time, date & place in presence of qualified bidders or their representative.
20. The bid submitted shall become invalid if:
    (i) The bidder is found ineligible.
    (ii) The bidder does not deposit original EMD to the office of the Executive Engineer, IWD IIT Kanpur.
    (iii) The bidder does not upload scanned copies of all the documents stipulated in the bid document.
    (iv) If a bidder quotes nil rates against each item in scheduled of quote of tender or does not quote any rate in any section/sub head in rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer.
21. Intending Bidders are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their bids as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid. A bidders shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. The bidders shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a bid by a bidders implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Government and local conditions and other factors having a bearing on the execution of the work.
22. Canvassing whether directly or indirectly, in connection with bidders is strictly prohibited and the bids submitted by the contractors who resort to canvassing will be liable for rejection.
23. The contractor shall not be permitted to bid for works in the IWD in which his near relative is posted as a Divisional Accountant or as an officer in any capacity between the grades of Superintending Engineer and Junior Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any officer in the Institute Works Department IIT Kanpur.
24. No Engineer of Gazetted Rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is

allowed to work as a contractor for a period of one year after his retirement from Government service, without the prior permission of the Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the bid or engagement in the contractor's service.

25. **List of Documents to be filled in by the bidders in various forms as indicated in Section III and other documents, to be scanned & uploaded within the period of bid submission and deposited in hard copy.**

1	Treasury challan /Demand draft/Pay order or Banker's Cheque/ Deposit at Call Receipt/Fixed Deposit Receipt of a Scheduled Bank/ Bank Guarantee of any Scheduled Bank against EMD (scan copy of the EMD is to be uploaded and original copy of EMD shall be deposited to the office of Executive Engineer, Civil Division-I, IWD, IIT, Kanpur **on or before 08.11.2025 upto 12.30 PM.**
2	Letter of transmittal
3	Certificate of Financial Turnover for the last five years from Charted Accountant **(Form 'A')**.
4	Banker's certificate of the amount equal to **40% of the estimated cost put to tender** (ECPT)**. (Form 'B')**. OR Networth certificate of minimum **10% of the estimated cost put to tender** issued by a certified Chartered Accountant with UDIN. **(Form 'B1').**
5	Details of eligible similar nature of works completed during the last seven years ending previous day of last date of submission of tenders **(Form 'C')**
6	Details of Projects under execution **(Form 'C-1')**.
7	Calculation of bidding capacity **(Form 'C-2')**.
8	Performance report of works referred to in Form 'C' **(Form 'D')** .
9	Affidavit as per provision of CPWD-6 **(Form 'E')**.
10	GST Registration Certificate
11	Declaration about site inspection (Form 'F')
12	Permanent Account Number (PAN) as issued by the Income Tax Department
13	Copy of Registration of the concern department.
14	Copy of EPF & ESIC registration.

Superintending Engineer

SECTION- I

BRIEF PARTICULARS OF THE WORK

1. Salient details of the work for which bids are invited are as under

Sl. No.	**Name of work**	Estimated Cost (Rs.) Including GST	**Period of completion**
1.	**Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR**	Civil- 59,02,535/- Electrical- 5,63,476/- HVAC- 3,71,520/- **Total-** 68,37,531/-	**01 Month**

2. **The work is situated inside IIT Kanpur campus, Kalyanpur, Kanpur (UP) Pin: 208016.**
3. **General features and scope of the work is as under:**
   The scope covers construction of RCC/ Structural steel framed structure building including Internal water supply, Sanitary installation, Drainage and electrical works.
   Above details and status are only indicative but not exhaustive. The intending bidder shall inspect the site and fully acquaint with nature of work and site condition and assess/ satisfy himself before quoting and submission of his bid. He is also advised to inspect the indicative drawings attached with this tender document to acquaint with other details about the building.

4. Work shall be executed according to General Conditions of Contract for Central P.W.D. Works with correction slips issued as specified in **Schedule F**.

SECTION- II
INFORMATION & INSTRUCTIONS FOR BIDDERS

1.0 General:

The Indian Institute of Technology, Kanpur, is an institution of premier repute, decided to construct "**Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR**

1.1 It is a very prestigious and time-bound project being monitored by the highest authority.

1.2 Letter of transmittal and forms for deciding eligibility are given in Section III.

1.3 All information called for in the enclosed forms should be furnished against the relevant columns in the forms. If for any reason, information is furnished on a separate sheet, this fact should be mentioned against the relevant column. Even if no information is to be provided in a column, **a "nil" or "no such case"** entry should be made in that column. If any particulars/query is not applicable in case of the bidder, it should be stated **as "not applicable".** The bidders are cautioned that not giving complete information called for in the application forms or not giving it in clear terms or making any change in the prescribed forms or deliberately suppressing the information may result in the bid being summarily disqualified. Bids made by telegram or telex and those received late will not be entertained.

1.4 The bid should be type- written. The bidder should sign each page of the application.

1.5 Overwriting should be avoided. Correction, if any, should be made by neatly crossing out, initialing, dating and rewriting. Pages of the eligibility criteria document are numbered. Additional sheets, if any added by the contractor, should also be numbered by him. They should be submitted as a package with signed letter of transmittal.

1.6 References, information and certificates from the respective clients certifying suitability, technical knowledge or capability of the bidder should be signed by an officer not below the rank of Executive Engineer or equivalent.

1.7 The bidder may furnish any relevant additional information which he thinks is necessary to establish his capabilities to successfully complete the envisaged work. He is, however, advised not to furnish superfluous information. No information shall be entertained after submission of eligibility criteria document unless it is called for by the Employer.

2.0 Definitions:

2.1 In this document the following words and expressions have the meaning hereby assigned to them.

2.2 **Employer:** Means the Board of Governors, IIT Kanpur, acting through the

S**uperintending Engineer, IWD IIT Kanpur**.

2.3 **Bidder and/or contractor:** Means the individual, proprietary firm, firm in partnership, limited company private or public or corporation.

2.4 **"Year"** means "Financial Year" unless stated otherwise.

3.0 Method of application:

3.1 If the bidder is an individual, the application shall be signed by him above his full type written name and current address.

3.2 If the bidder is a proprietary firm, the application shall be signed by the proprietor above his full type written name and the full name of his firm with its current address.

3.3 If the bidder is a firm in partnership, the application shall be signed by all the partners of the firm above their full type written names and current addresses, or, alternatively, by a partner holding power of attorney for the firm. In the latter case a certified copy of the power of attorney should accompany the application. In both cases a certified copy of the partnership deed and current address of all the partners of the firm should accompany the application.

3.4 If the bidder is a limited company or a corporation, the application shall be signed by a duly authorized person holding power of attorney for signing the application accompanied by a copy of the power of attorney. The bidder should also furnish a copy of the Memorandum of Articles of Association duly attested by a Public Notary.

4.0 Final decision-making authority.

The employer reserves the right to accept or reject any bid and to annul the process and reject all bids at any time, without assigning any reason or incurring any liability to the bidders.

5. **Particulars provisional**

The particulars of the work given in Section I are provisional. They are liable to change and must be considered only as advance information to assist the bidder.

6. **Site visit**

The bidder is advised to visit the site of work, at his own cost, and examine it and its surroundings to himself collect all information that he considers necessary for proper assessment of the prospective assignment.

7.0 Initial criteria for eligibility

7.1 Bidder should have satisfactory completed works as mentioned below, during the last seven years ending previous day of last date of submission of tenders. For this purpose

cost of work shall mean gross value of the completed work. This should be certified by an officer not below the rank of Executive Engineer / Project Manager or equivalent. In case of works executed for private organizations, the certificate shall be signed by the chief consultant and countersigned by the owner of the Project.

(i) Three similar works each costing not less than Rs**. 27.35** lacs

OR

(ii) Two similar works each costing not less than Rs. **41.03** lacs

OR

(iii) One similar work costing not less than Rs. **54.70** lacs.

AND

One complete work costing not less than Rs. 27.35 lacs with some Central Government department / Central autonomous body / central public sector undertaking.

Similar work shall mean works of "Construction of RCC/Structural steel framed structure building including Internal water supply, Sanitary installation, Drainage, electrical all executed under single agreement".

Note:

1. As mentioned in the definition of similar work constructed in each work of the financial magnitude as specified above.

7.2 The bidder should have had average annual financial turn over gross of **Rs . 20.51 lacs** on construction work during the last three consecutive years **balance sheets duly audited by Charted Accountant.** Year in which no turnover is shown would also be considered for working out the average.

7.3 The bidder should not have incurred any loss **(profit after tax should be positive)** in more than two years during **available last five consecutive balance sheets,** duly certified **and audited** by the Chartered Accountant.

7.4 Networth certificate of **minimum 10% of the estimated cost put to tender** issued by certified Chartered Accountant with UDIN.

OR

Banker's Certificate of the amount **equal to 40% of the estimated cost put to tender** (ECPT).

7.5 Should have the calculated bidding capacity equal to or more than the estimated

cost of the work and shall provide the data required in soft copy for calculating the bidding capacity.

The bidding capacity shall be = (1.5*N*A-B), where

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

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

B = Value of the existing commitments and ongoing works.

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

8.0 Evaluation criteria

8.1 The detailed submitted by the bidders will be evaluated in the following manner:

8.1.1 The initial criteria prescribed in para **7.0** above in respect of experience of eligible similar works completed, loss (Profit after tax), solvency, financial turn over, bidding capacity, etc will first be scrutinized and the bidder's eligibility for the work be determined.

8.1.2 The bidders qualifying the initial criteria as set out in para **7.0** above will be evaluated.

9.0 Evaluation of performance

Evaluation of the performance of contractors for the eligibility shall be done by the scrutiny committee. All the eligible Similar Works executed and submitted by the bidders may be got inspected by the committee if required.

10.0 Financial information

Bidder should furnish the following financial information:

Annual financial statement for the last five year in (**Form "A")** and Banker's certificate in (**Form "B")** or Net worth certificate in **(Form- B-1)**

11.0 Experience in works highlighting experience in similar works

Bidder should furnish the following:

(a) List of eligible similar nature of work successfully completed during the last seven years in (**Form "C**") and ongoing works as well in (**Form-C-1**).

(b) Performance report of works referred in form "C" (In **Form "D**") signed by officer not below the rank of Executive Engineer /Project Manager or

equivalent. The performance report should explicitly mention that the building work including water supply, sanitary installation in single agreement.

12.0 Letter of transmittal

The bidder should submit the letter of transmittal attached with the document.

13.0 Opening of Price bid

After evaluation of Pre-Qualification Documents, a list of short listed agencies will be prepared. Thereafter the financial bids of only the qualified and technically acceptable bidders shall be opened at the notified time, date and place in the presence of the qualified bidders or their representatives. The bid shall remain valid for **90 days from the date of opening of Technical (eligibility) bid.**

14.0 Award criteria

14.01 The employer reserves the right, without being liable for any damages or obligation to inform the bidder, to:

(a) Amend the scope and value of contract to the bidder.

(b) Reject any or all the applications without assigning any reason.

14.02 Any effort on the part of the bidder or his agent to exercise influence or to pressurize the employer would result in rejection of his bid. Canvassing of any kind is prohibited.

14.03 The main contractor has to associate the agencies for electrical & HVAC confirming to eligibility criteria as defined in the bid document and has to submit a detail to the Superintending Engineer for approval.

SECTION- III

INFORMATION REGARDING ELIGIBILITY LETTER OF TRANSMITTAL

From

To,

The Superintending Engineer

IWD, IIT, Kanpur

Subject: Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR

Sir,
Having examined the details given in press notice and bid document for the above work, I/we hereby submit the relevant information.

1. I/we hereby certify that all the statement made and information supplied in the **enclosed forms A to I** and accompanying statement are true and correct.
2. I/we have furnished all information and details necessary for eligibility and have no further pertinent information to supply.
3. I/we submit the requisite certified certificate and authorize the **Superintending Engineer, IWD IIT Kanpur** to approach the Bank issuing the solvency certificate to confirm the correctness thereof. I/we also authorize **Superintending Engineer, IWD IIT Kanpur** to approach individuals, employers, firms and corporation to verify our competence and general reputation.
4. I/we submit the following certificates in support of our suitability, technical knowledge and capability for having successfully completed the following **eligible similar** works:

Sl. No.	Name of work	Certificate from
1		
2		
3		

Certificate:

It is certified that the information given in the enclosed eligibility bid of are correct. It is also certified that I/we shall be liable to be debarred, disqualified / cancellation of enlistment in case any information furnished by me/us found to be incorrect.

Enclosures: Seal of bidder
Date of submission: Signature(s) of Bidder(s).

FORM 'A'

FINANCIAL INFORMATION

1. Financial Analysis – Details to be furnished duly supported by figures in balance sheet/ profit & loss account for the last five years duly certified by the Chartered Accountant, as submitted by the applicant to the Income Tax Department. (Copies to be attached).

Financial Year

Year	2020-21	2021-22	2022-23	2023-24	2024-25
Gross Annual turnover on construction works					
Profit / Loss. (Standalone Financial Turnover)					

2. Financial arrangements for carrying out for proposed work.

Signature of Chartered Accountant with Seal **Signature of Bidder(s).**

* **The bidder should give information strictly in above format.**

FORM "B"

BANKER'S CERTIFICATE FROM A COMMERCIAL BANK

This is to certify that to the best of our knowledge and information that M/s./Sh..... having marginally noted address,…… as a customer of our bank are/is respectable and can be treated as good for any engagement up to a limit of Rs ..... (Rupees ……..) This certificate is issued without any guarantee or responsibility on the bank or any of the officers.

(Signature)
for the Bank

NOTE:

1. Bankers certificates should be on letter head of the Bank, addressed to tendering authority.
2. In case of partnership firm, certificate should include names of all partners.

FORM "B-1"

CERTIFICATE OF NET WORTH FROM CHARTERED ACCOUNTANT

"It is to certify that as per the audited Balance Sheet and Profit & Loss account during the financial year ....., the net worth of M/s./Sh.....(Name & Registered Address of individual/firm/company) as on 31.03.2025 is Rs.....after considering all liabilities.. It is further certified that the net worth of the company has not eroded by more than 30% in the last three years ending on 31.03.2025".

Unique Document Identification Number (UDIN).....

Signature of Chartered Accountant.....
Name of the Chartered Accountant.....
Membership No. of ICAI
Date & Seal

FORM 'C'

DETAILS OF ELIGIBLE SIMILAR NATURE OF WORKS COMPLETED DURING THE LAST SEVEN YEARS ENDING LAST DAY OF THE MONTH PREVIOUS TO THE MONTH IN WHICH TENDERS ARE INVITED.

S. No	Name of work/project and location	Owner of sponsoring organization	Cost of work	Date of commencement as per contract	Stipulated date of completion	Actual date of completion	Litigation/ arbitration cases pending /in progress with	Name and address /telephone number of officer	Whether the work was done on back to back basis Yes/No
1	2	3	4	5	6	7	8	9	10

***** Indicate gross amount claimed and amount awarded by the Arbitration Tribunal.

Signature of Bidder(s)

Note: The agency should give list of only those eligible works which are of **'SIMILAR NATURE'**.

FORM 'C-1'

PROJECTS UNDER EXECUTION

Sl. No.	Name of work / project and Location	Owner or sponsoring organization	Cost of work in crore of Rupees	Date of commencement as per contract	Stipulated date of completion	Up to date percentage progress of work	Slow progress if any and reasons there of	Name and address (Postal address & E-mail) / Telephone Number / Mobile number of officer to whom reference may be made.	Remarks
1	2	3	4	5	6	7	8	9	10

Signature of Bidder(s)

FORM 'C-2'

CALCULATION OF BIDDING CAPACITY

Details of existing commitments and ongoing works.

Sl.No.	Name of work / project and location	Owner or sponsoring organization	Contract value in crore of Rupees	Date of commencement as per contract	Stipulated date of completion	Up to date percentage progress of work	Remaining work in percentage (100-column7)	Existing commitment Column 4x Column 8/100 to be made	Name and address / Telephone Number of officer to whom reference may be made.	Remarks
1	2	3	4	5	6	7	8	9	10	11

Total (B) =

Maximum turnover in last seven years

Updated value of turnover (A)

No. of years (N)

Bidding Capacity = {[AxNx1.5]-B} =

Certificate:

I certify that all the awarded and ongoing works have been included in the above list.

(Signature of Bidder(s))

FORM 'D'

PERFORMANCE REPORT OF WORKS REFERRED TO IN FORMS "C"

1. Name of work/project & location:
2. Agreement no.:
3. Estimated cost:
4. Tendered cost:
5. Value of work done
6. Date of start:
7. Date of completion:
8. Stipulated date of completion:
9. Actual date of completion:
   (a) Whether case of levy of compensation for delay has been decided or not Yes/No compensation levied for delayed completion, if any:
   (b) If decided, amount of compensation levied for delayed completion, if any:
10. Performance Report:
    (a) Quality of work: Outstanding / Very Good / Good /Poor
    (b) Financial soundness: Outstanding / Very Good / Good /Poor
    (c) Technical Proficiency: Outstanding / Very Good / Good /Poor
    (d) Resourcefulness: Outstanding / Very Good / Good /Poor
    (e) General Behavior: Outstanding / Very Good / Good /Poor

Dated: **Executive Engineer or Equivalent**

Note: If Name of Work is not clearly defining scope of work as specified in the definition of similar work, bidders are advised to upload copy of Agreement/ final bill or any other relevant document in support of their proposed completed work definition of similar work.

FORM "E"

Affidavit as per provision of CPWD-6

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

NOTE: Affidavit to be furnished on a 'non-judicial' stamp paper worth Rs.100/-

Signature of Bidder(s) or an authorized Officer of the firm with stamp

Signature of Notary with seal

FORM 'F'

Declaration about Site Inspection

(By Bidder)

To

The Executive Engineer,

IWD, IIT,

Kanpur

Subject: Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR

Dear Sir/Madam,

It is hereby declared that as per terms and conditions of this tender document, **I/** We the bidder inspected and examined the subject site and its surrounding and satisfy myself / ourselves as to the nature of the ground and sub-soil (so far as is practicable), the forms and nature of the site./ ourselves before submitting the bid, the accommodation which may require and all necessary information as to risks, contingencies and other circumstances which may influence or affect our bid have been obtained. I/We the bidder shall have full knowledge of the site and no extra charge consequent upon any misunderstanding or otherwise shall be claimed in later date. I /We bidder shall be responsible for arranging and maintaining at own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a bid by me/us implies that I **/** We have read this notice and all other contract documents and has made myself /ourselves aware of the scope and specifications of the work to be done and local conditions and other factors having a bearing on the execution of the work.

Sincerely

(Duly authorized signatory of the Bidder)

FINANCIAL BID

CPWD-6 FOR e-Tendering

The Superintending Engineer, IWD IIT Kanpur invites on behalf of Board of Governors, online percentage rate open bids from eligible firms/contractors of repute in two bid system (Eligibility cum Technical bid & Financial Bid) for the work of - **Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR**

1. The work is estimated to cost **Rs. 68,37,531.00** This estimate, however, is given merely as a rough guide.
2. Contractors who fulfil the following requirements shall be eligible to apply. **Joint ventures and Special Purpose Vehicles are not allowed to participate.**
3. Agreement shall be drawn with the successful bidders on prescribed Form No. **CPWD 7** which is available as a Govt. of India Publication and also available on website www.iitk.ac.in/iwd/tenderhall.htm , https://eprocure.gov.in/eprocure/app , but the bids can only be submitted online through, https://eprocure.gov.in/eprocure/app. his rates including all applicable taxes **including GST** as per various terms and conditions of the said modified form which will form part of the agreement.
4. The time allowed for carrying out the work will be **01 Month** from the date of start as defined in schedule 'F' or from the first date of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the bid documents.
5. The site for the work is available.
6. The bid document consisting of plans, specifications to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents except Standard General Conditions of Contract Form can be seen on website www.iitk.ac.in/iwd/tenderhall.htm, https://eprocure.gov.in/eprocure/app free of cost but the bids can only be submitted online through, https://eprocure.gov.in/eprocure/app.
7. After submission of the bid the contractor can re-submit revised bid any number of times but before last time and date of submission of bid as notified.
8. While submitting the revised bid, contractor can revise the rate of one or more item(s) any number of times (he need not re-enter rate of all the items) but before last time and date of submission of bid as notified.
9. This bid is invited in two bid system.
   a) Applicant has to deposit earnest money of **Rs. 1,36,751.00** in the form of receipt/ Treasury Challan or Demand Draft or Pay order or Banker's Cheque or Deposit at Call

Receipt or Fixed Deposit Receipt (drawn in favour of Director IIT Kanpur) along with tender document.

i. Earnest Money in the form of Treasury Challan or Demand Draft or Pay order or Banker's Cheque or Deposit at Call Receipt or Fixed Deposit Receipt (drawn in favour of the Director, IIT Kanpur) shall be scanned and uploaded to the e-Tendering website within the period of bid submission.

ii. **The original EMD shall be submitted in the hard copy to the office of the Executive Engineer, Civil Division-I, IWD, IIT, Kanpur upto 12.30 PM on 08.11.2025.**

10. The bid submitted shall become invalid if:

a) The bidder is found ineligible.

b) The bidder does not deposit original EMD to the office of the Executive Engineer, IWD IIT Kanpur.

c) The bidder does not upload scanned copies of all the documents stipulated in the bid document.

d) If a bidder quotes nil rates against each item in scheduled of quote of tender or does not quote any rate in any section/sub head in rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer

11. If a bidder quotes nil rates against each item in scheduled of quote of tender or does not quote any rate in any section/sub head in rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer. The contractor whose bid is accepted will be required to furnish **performance guarantee of 5% (Five Percent)** of the bid amount within the period specified in Schedule F. This guarantee shall be in the form of Deposit at Call receipt /Banker's cheque /Demand Draft /Pay order or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the prescribed form. In case the contractor fails to deposit the said performance guarantee within the period as indicated in Schedule 'F', including the extended period if any, the Earnest Money deposited by the contractor shall be forfeited automatically without any notice to the contractor. **The earnest money deposited along with bid shall be returned after receiving the aforesaid performance guarantee.** The contractor whose bid is accepted will be also be required to furnish copy of applicable licenses/registrations or proof of applying for obtaining labor licenses, registration with EPFO, ESIC and BOCW Welfare Board including provident fund code no. if applicable.

12. Scope of the work is as follows:

a) EARTH WORK
b) CEMENT CONCRETE (CAST IN SITU)
c) REINFORCED CEMENT CONCRETE
d) Structural Steel Work
e) MASONRY WORK
f) CLADDING WORK
g) WOOD AND P. V. C. WORK
h) FLOORING
i) ROOFING
j) FINISHING
k) Dismantling and Demolishing
l) ROAD WORK
m) DRAINAGE
n) ALUMINIUM WORK
o) Plumbing Work
p) Electrical Works
q) HVAC Work

13. The competent authority on behalf of the Board of Governors, IIT Kanpur does not bind itself to accept the lowest or any other bid and reserves to itself the authority to reject any or all the bids received without the assignment of any reason. All bids in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the bidders shall be summarily rejected.

14. Canvassing whether directly or indirectly, in connection with bidders is strictly prohibited and the bids submitted by the contractors who resort to canvassing will be liable for rejection.

15. The competent authority on behalf of Board of Governors, IIT Kanpur reserves to himself the right of accepting the whole or any part of the bid and the bidders shall be bound to perform the same at the rate quoted.

16. The bid for the works shall remain open for acceptance for a period of Ninety (90) days from the date of opening of technical bid. If any bidders withdraws his bid before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the bid which are not acceptable to the department, then the Government shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money as aforesaid. Further the bidders

shall not be allowed to participate in the rebidding process of the work.

17. This notice inviting Bid shall form a part of the contract document. The successful bidders/contractor, on acceptance of his bid by the Accepting Authority shall **within 7 days from the stipulated date of start of the work, sign the contract** consisting of:-

a) The Notice Inviting Bid, all the documents including additional conditions, specifications and drawings, if any, forming part of the bid as uploaded at the time of invitation of bid and the rates quoted online at the time of submission of bid and acceptance thereof together with any correspondence leading thereto.

b) Standard C.P.W.D. Form 7 i/c upto date amendments and duly modified for Percentage rate contract work or other Standard C.P.W.D. Form as applicable.

Superintending Engineer

CPWD-7

INDIAN INSTITUTE OF TECHNOLOGY, KANPUR

INSTITUTE WORKS DEPARTMENT

CENTRAL OFFICE

Percentage Rate Tender & Contract for Works.

Tender for the work of: **Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR**

TENDER

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

I/We hereby tender for the execution of the work specified for the Board of Governor, IIT Kanpur within the time specified in Schedule 'F' viz., schedule of quantities and in accordance in all respect with the specifications, designs, drawing and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of contract and with such materials as are provided for, by, and in respect of accordance with, such conditions so far as applicable.

We agree to keep the tender open for **ninety (90) days** from the due date of its opening and not to make any modification in its terms and conditions.

A sum of **Rs. 1,36,751.00** is hereby forwarded in cash/receipt treasury challan/ deposit at call receipt of a scheduled bank/fixed deposit receipt of scheduled bank/demand draft of a scheduled bank/bank guarantee issued by a scheduled bank as earnest money. If I/We, fail to furnish the prescribed performance guarantee within prescribed period. I/We agree that the said President of India or his successors, in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, if I/We fail to commence work as specified, I/We agree that Board of Governor, IIT Kanpur or the successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works

referred to in the tender documents upon the terms and conditions contained or referred to those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form. Further, I/We agree that in case of forfeiture of Earnest Money & Performance Guarantee as aforesaid. I/We shall be debarred for participation in the re-tendering process of the work.

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

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

Dated :

Signature of Contractor

Witness

Postal Address

Address:

Occupation:

ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me for an on behalf of the Board of Governors, IIT Kanpur for a sum of Rs……..…….. (Rupees ……..……. ……).

The letters referred to below shall form part of this contract agreement:

(a)

(b)

(c)

For & on behalf of Board of Governors, IIT Kanpur

Signature……..……..

Dated: Designation ……..

PROFORMA OF SCHEDULES (A to F)

(For Civil, Electrical & HVAC Work)

SCHEDULE 'A'

Schedule of financial quote in Part E of NIT

SCHEDULE 'B'

Schedule of materials to be issued to the contractor.

S. No.	Description of item	Quantity	Rates in figures & words at which the material will be charged to the contractor	Place of issue
1	2	3	4	5
---------NIL----------				

SCHEDULE 'C'

Tools and plants to be hired to the contractor

S. No.	Description	Hire charges per day	Place of Issue
1	2	3	4
---------NIL----------			

SCHEDULE 'D'

Extra schedule for specific requirements/document for the work, if any. **As attached in tender form**

SCHEDULE 'E'

Reference to General Conditions of contract: General condition of contract for CPWD-23 for Construction works (with amendments up to pervious date of last date of receipt of tender including extension, if any).

Name of Work: Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR		
Estimated cost of the work:	Estimated Cost (Rs.) Including GST	Civil- 59,02,535/- Electrical- 5,63,476/- HVAC- 3,71,520/- **Total-** 68,37,531/-
Earnest money	**Rs. 1,36,751.00** (To be returned after receiving performance guarantee)	
Performance Guarantee	5% of the tendered value of the work	
Security Deposit	2.5% of the tendered value of the work	

SCHEDULE 'F' GENERAL RULES & DIRECTIONS

Officer inviting tender	**Superintending Engineer, IWD, IIT Kanpur**

Definitions:

2(i)	Engineer-in-charge	
	For civil item works For Electrical works	**Executive Engineer (Civil)** **Executive Engineer (Electrical)**
2(viii)	Accepting authority	**Superintending Engineer, IWD, IIT Kanpur**
2(x)	Percentage on cost of materials and labour to cover all overheads and profits	15%
2(x)(b)	**Standard Schedule of Rates:** Civil Items of Work: Electrical items HVAC items	 **D.S.R. 2023** (with up to date correction Slips) & Market Rates of Non DSR items DSR & Market Rates Market Rates & DSR
2(xi)	Department	IWD, IIT Kanpur

9 (ii)	Standard CPWD contract Form:	GCC 2023, CPWD **form-7** as modified & corrected up to the last date of submission of bid (Whether correction vide latest circulars are in corporate or not in this document). a. The Quoted rates should be inclusive of GST.
Clause 1	Time allowed for submission of Performance Guarantee, applicable labour licenses, registration with EPFO, ESIC and BOCW Welfare Board or proof of applying thereof from the date of issue of letter of acceptance from the date of issue of letter of acceptance.	7 Days
Clause 1A	The Defect liability period shall be one year from the date of handing over of the assigned works to the user/Institute	Applicable.
Clause 2	Authority for fixing Compensation under Clause 2	**SE, IWD, IIT, Kanpur.** **Or successor thereof**
Clause 2A	Whether Clause 2A shall be applicable	NA
Clause 5	i) Number of days from the date of issue of issue of letter of acceptance for reckoning date of start ii) Time allowed for execution of work	07 days **01 Month**

Authority to decide	Extension of time (EOT)	**Superintending Engineer, IWD IIT Kanpur**
	Shifting of date of start in case of delay in handing over of site	**Superintending Engineer, IWD IIT Kanpur**
Clause 6	Computerized Measurement of bills	**APPLICABLE**
Clause 7	Gross work to be done together with net payment /Adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment.	**20 lacs**
Clause 7A	Whether clause 7A shall be applicable. No running account bill shall be paid for the work till the applicable labour licence, BOCW registration is submitted to the Engineer In charge.	**Yes**
Clause 8A	Authority to decide compensation on account if the contractor fails to submit completion plans	**Superintending Engineer, IWD IIT Kanpur**
Clause 10A	Material to be provided by the contractor	**APPLICABLE**

Clause 10B (ii), (iii)	Whether clause 10-B (ii) and 10-B (iii) shall be applicable.	**APPLICABLE**
Clause 10 C	Component of labour expressed as percentage of value of work	**NOT APPLICABLE**
Clause 10 CA		**NOT APPLICABLE**
Clause 10 CC	Increase/Decrease in Price of materials/wages	**NOT APPLICABLE**
Clause 11		CPWD Specifications of all Civil items (CPWD Civil specification vol.1 and vol.2, 2019), with correction Slips issued up to the last date of receipt of tenders and as per NIT for Civil Works.
Clause 12: Type of work		**Original work**
Deviation limit beyond which clause 12.2 & 12.3 shall apply for Building works		**100% for all items**
Clause 16 Competent Authority for deciding reduced rates		**Superintending Engineer, IWD IIT Kanpur**
Clause 17 - Defect liability period completion of contract whichever is later		**One year from the date of virtual completion of work.**

Clause 32 : Requirement of Technical staff

Sl. No.	Qualification	Number	Minimum Experien	Designation	Rate at which the recovery shall be made from the

			ce in years		contractor in the event of not fulfilling provisionof Clause 32
1.	Graduate / Diploma	1	2 or 5 years respectiv ely	Project Manager cum Planning / quality / Site / billing Engineer (Civil)	Rs. 25000/- (Rupees Twenty Five Thousand only) per month, per person
Note: Assistant Engineers retired from Government services who are holding Diploma will be treated at par with Graduate Engineers. **Diploma holder with minimum 10 years relevant experience with a reputed construction co. can be treated at par with Graduate Engineers for the purpose of such deployment subject to the condition that such diploma holders should not exceed 50% of requirement of degree engineer.**					

GENERAL CONDITIONS AND MATERIAL AND QUALITY ASSURANCE

GENERAL REQUIREMENTS FOR THE TENDER

Name of Work: "**Construction of Cafeteria at Visitor Hostel - 1 , IIT KANPUR**

1 The tenderer is advised to read and examine the tender documents for the work and the set of drawings available with Engineer-in-charge. He should inspect and examine the site and its surroundings by himself before submitting his tender in percentage above / below over the estimated cost.

2 Separate conditions & specification and scope are included in this tender. The contractor shall quote the amount/rates in figures and words accurately in schedule of financial quote so that there is no discrepancy in figures and words.

3 Time allowed for the execution of work is 01 **month**.

4 Quality of the project is of utmost importance. This shall be adhered to in accordance with the provisions of CPWD specifications and guidelines given in the relevant paras.

5 Temporary Electric connection (Single/ Three phase) shall be provided by the Institute from its distribution network and the charges shall be realized prevalent commercial tariff of the institute presently recovery rate is Rs. 9.19 Per unit on the basis of actual consumption through the separate meter under the control of Engineer-In-Charge. If the rates are revised in future the same shall be applicable to the contractor. The contractor at his own cost shall arranged the cables for the service connection and the sub meter. The fixed charges shall be payable as per Institute policy if power connection load exceeds the 5 Kw.

6 No labor huts/jhuggis shall be allowed to construct in the campus except for the security persons at work site with proper sanitation arrangements after due approval of Superintending Engineer.

7 Permission for boring may not be allowed being VH premises. The contractor shall be allowed to use water from Institute Water Supply network & 1% water charges shall be recovered.

8 **Cement shall be arranged by the contractor himself.**

9 **Steel Reinforcement shall be arranged by the contractor himself.**

10 Contractor has to engage specialized agencies for specialized items of works such as electrical & HVAC and other specialized items as mentioned in the tender document. Only those specialized agencies/firms who have satisfactorily executed works as per

following criteria during last seven years are eligible for the specialized works-

(a) Three works each costing not less than 40% of estimated cost for concerned sub head.

Or

(b) Two works each costing not less than 60% of estimated cost for concerned sub head. **Or**

(c) One work costing not less than 80% of estimated cost for concerned sub head.

11 The contractor shall submit the running bills in the shape of the computerized MB in pages of A-4 size as per the standard format of department and shall act as per modified Clause 6 A of CPWD-7.

12 The approval of specialized agency shall be taken by the agency from Superintending Engineer, IWD, IIT, Kanpur.

MATERIAL AND QUALITY ASSURANCE

1. The contractor shall ensure quality control measures on different aspects of construction including materials, workmanship and correct construction methodologies to be adopted. He shall have to submit quality assurance programme within two weeks of the award of work. The quality assurance programme should include method statement for various items of work to be executed along with check lists to enforce quality control.

2. The contractor shall get the source of all other materials, not specified elsewhere in the document, approved from the Engineer-in-Charge. The contractor shall stick to the approved source unless it is absolutely unavoidable. Any change shall be done with the prior approval of the Engineer-in-Charge for which tests etc. shall be done by the contractor at his own cost. Similarly, the contractor shall submit brand/ make of various materials not specified in the agreement, to be used for the approval of the Engineer-in-Charge along with samples and once approved, he shall stick to it.

3. The contractor shall submit shop drawings of staging and shuttering arrangement, aluminum & glazing work, fire doors and fittings, plumbing work and other works as desired by Engineer In Charge for his approval before execution. The contractor shall also submit bar bending schedule for approval of Engineer-in- charge before execution.

4. Frequency and type of tests of various Materials/items/ article shall be conducted as per specifications and relevant BIS-Codes. The test results confirm to the specification/codes.

a) Sampling of Materials:

- 1. Sample of building materials fittings and other articles required for execution of work shall be got approved from the Engineer-in-Charge. Articles manufactured by companies of repute and approved by the Engineer-in-Charge shall only be used. Articles bearing BIS certification mark shall be used in case the above are not available, the quality of samples brought by the contractor shall be judged by standards laid down in the relevant BIS specifications. All materials and articles brought by the contractor to the site for use shall conform to the samples approved by the Engineer-in-Charge.
- The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material/work beyond set out tolerance limit shall be summarily rejected by the Engineer-in-Charge.
- BIS marked materials except otherwise specified shall be subjected to quality test at the discretion of the Engineer-in-Charge besides testing of other materials as per the specifications described for the item/materials. Wherever BIS marked materials are brought to the site of work, the contractor shall if required, by the Engineer-in-Charge furnish manufacturers test certificate to establish that the material produced by the contractor for incorporation in the work satisfies the provisions of BIS codes relevant to the material and/or the work done.

- The contractor shall procure all the materials in advance so that there is sufficient time to testing and approving of the materials and clearance of the same before use in work.
- All materials brought by the contractor for use in the work shall be got checked from the Engineer-in-Charge or his authorized representative of the work on receipt of the same at site before use.
- The contractor shall be fully responsible for the safe custody of the materials issued to him even if the materials are in double lock and key system.

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

6 Cement register showing the receipt of the PPC shall be maintained at site. The contractor shall construct godown for storage of PPC at site and nothing extra on this account shall be payable.

Additional Condition for cement

1. The contractor shall procure 43 grade Portland Pozzolana Cement conforming to IS: 1489 (Part-I) as required in the work, from reputed manufacturers of cement, such as A.C.C., Ultratech, Vikram, Shree cement, Ambuja, Jaypee Cement, Century Cement & J.K. Cement. The tenderers may also submit a list of names of cement manufacturers which they propose to use in the work. The tender accepting authority reserves right to accept or reject name(s) of cement manufacturer(s) which the tenderer proposes to use in the work. No change in the tendered rates will be accepted if the tender accepting authority does not accept the list of cement manufacturers, given by the tenderer, fully or partially. Supply of cement shall be made in 50 kg. bags bearing manufacturer's name and ISI marking.

   Samples of cement arranged by the contractor shall be taken by the Engineer- in-Charge and got tested in accordance with provisions of the relevant BIS codes. In case the test results indicate that the cement arranged by the contractor does not conform to the relevant BIS code the same shall stand rejected and shall be removed from the site by the contractor at his own cost within a week's time of written order from the Engineer-in- Charge to do so.

2. The cement shall be got tested by the Engineer-in-Charge and shall be used on the work only after satisfactory test results have been received. The contractor shall supply free of charge the cement required for testing including its transportation cost to test laboratories.
3. Wet curing period shall be enhanced to a minimum of 10 days or its equivalent. In hot & arid regions, the minimum curing period shall be 14 days or its equivalent.
4. Till the time, BIS makes it mandatory to print the % age of fly ash on each bag of cement, the certificate from the PPC manufacturer indicating the same shall be obtained and permission obtained from Engineer-in-Charge before use of such cements in works.

ADDITIONAL CONDITIONS FOR STEEL REINFORCEMENT

1 The contractor shall procure TMT bars of **Fe 500D/Fe 550D** grade (the grade to procured is to be specified) from primary steel producers such as **SAIL, Tata Steel Ltd, RINL, Jindal Steel & power Ltd., and JSW Steel Ltd.** or any other producer as approved by CPWD.

2 The TMT bars procured from primary producers shall conform to manufacture's specifications.

3 TMT bars procured from primary producers; the specifications shall meet the provisions of IS 1786: 2008 pertaining to **Fe 500 D/Fe 550D** grade of steel.

PARTICULAR SPECIFICATIONS OF CIVIL WORKS :

A. The work shall be executed and measured as per metric dimensions given in the schedule of quantities, drawings, etc. (FPS units wherever indicated are for guidance only).

B. Stone aggregate of all grades shall be of hard stone variety fulfilling CPWD specifications 2019 Vol-I&II /relevant IS Code and shall be obtained from quarries approved by the Engineer-in-Charge

C. Sand to be used in cement concrete work, mortar for masonry and plaster work shall be of standard quality conforming to CPWD specifications 2019 Vol-I&II /relevant IS Codes and shall be obtained from quarries approved by the Engineer-in-Charge.

EARTH WORK:

1.1 The work shall be done in accordance with CPWD specifications.

1.2 The earthwork in excavation, wherever required, shall be carried out in slushy position. Rates for earthwork shall include cost of the element for working in or under water / liquid mud including pumping of water / liquid mud. Nothing extra shall be payable on this account. Therefore, the Contractor shall quote his rates after studying the site conditions.

1.3 Any trenching and digging for laying sewer lines/water lines/cables etc. shall be commenced by the contractor only when all men, machinery and materials have been arranged and closing of the trench(s) thereafter shall be ensured within the least possible time.

RCC WORK:

2.1 If the quantity of cement actually used in the work is found to be more than the theoretical quantity of cement including authorized variation, nothing extra shall be payable to the contractor on this account. In the event of it being discovered that after the completion of the work, the quantity of cement used is less than the quantity ascertained as herein before provided (allowing variation on the minus side as stipulated in clause 38) the cost of quantity of cement so less used shall be recovered from the contractor at the rate as specified in schedule —F‖. Decision of the Engineer-in- Charge in regard to the quantity of cement which should have been actually used as per the schedule and recovery at the rate specified shall be final and binding on the contractor.

2.2 For non-scheduled items, the decision of the Superintending Engineer, IWD, IIT Kanpur regarding theoretical quantity of the cement which should have been actually used shall be final and binding on the contractor.

2.3 Cement brought to site and cement remaining unused after completion of work shall not be removed from site without written permission of the Engineer-in-Charge.

2.4 In case the contractor brings surplus quantity of cement the same after completion of the work will be removed from the site by the contractor at his own cost after approval of the Engineer-in-Charge.

2.5 Cement register for the cement shall be maintained at site.

2.5.1 Coarse aggregate: As per CPWD Specifications

2.5.2 Fine Aggregate: As per CPWD Specifications.

2.5.3 Water: It shall conform to requirements laid down in IS:456 : 2000 and CPWD specifications.

2.5.4 Cement: Cement arranged by the contractor will be PPC (in bags) conforming to IS: 1489-Part-I. If for any reasons, cement other than that specified in this para for example OPC of grade 43 or higher grade is brought to site by contractor, the issue, payments rate as well as the quantity to be used in the design mix concrete will remain unchanged.

2.5.5 Slump: Design slump should be clearly specified in the mix design.
Admixtures shall not be used without approval of Engineer-in-charge. Wherever required, admixtures of approved quality shall be mixed with concrete as specified. The admixtures shall conform to IS: 9103. The chlorides content in the admixture shall satisfy the requirements of BS: 5075. The total amount of chlorides admixture mixed in concrete shall also satisfy the requirements of IS: 456. The contractor shall not be paid anything extra for admixture required for achieving desired workability without any change in specified water cement ratio for RCC/CC work.

MASONRY WORK:

1.1 Brick masonry works shall be executed as per CPWD specifications 2019 complete as per direction of Engineer-in-Charge.

1.2 All masonry work in walls shall be Burnt clay FPS bricks as per GFC drawings.

1.3 Brick work with common burnt clay F.P.S. (non-modular) bricks (local Ist class) shall be done in walls as per GFC drawings and as per CPWD Specifications 2019 all complete as per direction of Engineer-in-Charge.

ALUMINIUM WORKS

The work of Aluminium door frame, windows, doors etc as per GFC drawings shall be carried out as per CPWD Specifications 2019 Vol-I & II and as per direction of Engineer-in-Charge.

Extent and Intent: - The work shall be carried out in the factory/site work shop by the contractor who shall furnish all material, labour, accessories, equipment, tool and plants and incidentals required for providing and installing anodized/powder coated aluminium doors, windows, claddings, louvers and other items as called for on the drawings. The drawings and specifications cover the major requirements only. The supplying of additional fastenings, accessories, fixtures and other items not mentioned specifically herein, but which are necessary to make a complete installation shall be a part of this contract.

General: - Aluminium doors, windows etc. shall be of sizes, section details as shown on the Architectural drawings. The details shown on the drawings indicate generally the sizes of the component parts and general standards. These may be varied slightly to suit the standard adopted by the manufacturers. Before proceeding with any manufacturing, the contractor shall prepare and submit complete manufacturing and installation drawings for approval of the Engineer-in-Charge and no work shall be performed until the approval of these drawings is obtained.

Shop Drawings: - The contractor shall submit the shop drawings of doors, windows, louvers, cladding and other aluminium work, based on the architectural drawings to the Engineer-in-Charge for his approval. The shop drawing shall show full size sections of doors, windows etc. thickness of metal (i.e. wall thickness) details of construction, sub frame/rough ground profile, anchoring details hardware as well as connection of windows, doors and other metal work to adjacent work. Samples of all joints and methods of fastening and joining shall be submitted to the Engineer-in-Charge for approval well in advance of commencing the work.

Samples: - Samples of doors, windows louvers etc. shall be fabricated, assembled in the factory/site work shop and submitted to Engineer-in-Charge for his approval. They shall be of sizes, types etc. as decided by Engineer-in-Charge. All samples shall be provided at the cost of the contractor.

Sections: - Aluminium doors and windows shall be fabricated from extruded sections of profiles as detailed on drawings. The sections shall be extruded by the manufacturers approved by the Engineer-in-Charge. The aluminium extruded sections shall conform to BIS designation IIE/IIV 9 WP alloy, with chemical composition technical properties, as per IS: 733 and IS: 1285. The permissible tolerance of the extruded sections shall be such as not to impair the proper and smooth function/ operations and appearance of doors and windows.

Fabrication: - Doors, windows etc. shall be fabricated to sizes at factory/site work shop and shall be of section, sizes, combinations and details as shown on the drawings. All doors, windows etc. shall have mechanical joints. The joints shall be designed to withstand a minimum wind load of 150 Kg. per Sqm. The design shall also incur that the maximum deflection of any member shall not exceed 1/175 of the span of the member. All members shall be accurately machined and fitted to form hairline joints prior to assembly. The joints accessories such as cleats, brackets etc. shall be of such material as not to cause any bimetallic action. The design of the joints and accessories shall be such that the accessories are fully concealed. The fabrication of doors, windows, etc. shall be done in suitable sections to facilitate easy transportation, handling and installation. Adequate provision shall be made in the door and window members for anchoring to support and fixing of hardware and other fixture as approved by the Architect.

Anodizing/ powder coating: - Aluminum sections which are to be powder coated shall have minimum 50 micron thickness as per requirement as per IS: 7088 and in required color as specified in the item as per IS: 1868 grading as specified in item schedule after cutting the

member to requisite sizes before the final assembly. Powder coating shall be of minimum 50 micron thickness.
Aluminium sections which are to be anodized, their anodizing shall confirm to specified grade with minimum average thickness of 15 microns when measured as per IS: 612. The anodic coating shall be properly sealed by steams or in boiling water are cold sealing process as per IS:1868/IS: 6057. Polythene tape protection shall be applied on the anodised section before they are brought to site. All care shall be taken to ensure surface protection during transportation, storage at site and installation. The tape protection shall be removed on installation. The sample will be tested in the approved laboratory and cost of samples; etc. shall be borne by the contractor.
Protection of finish: - All aluminium members shall be wrapped with approved self- adhesive non-staining. PVC tapes.

Handling and Stacking: -
Fabricated materials shall be carried in an approved manner to protect the material against any damage during transportation. The loading and unloading shall be carried out with utmost care. On receipt of material at site, it shall be carefully examined to detect any damaged pieces. Arrangements shall be made for expeditious replacement of damaged pieces/ parts. Materials found to be acceptable on inspections shall be repacked in crates and stored safely.
In the case of composite windows and doors, the different units are to be assembled first. The assembled composite units should be checked for line, level and plumb before final fixing is done. Units may be serial numbered and identified as out how to be assembled in their final locations if situation so warrants.
The contractor shall be responsible for assembling composite, bedding and filling the grove with polysulphide sealant inside and outside, at transoms and mullions placing the doors, windows etc. in their respective openings. After the doors/ windows have been fixed in their correct assigned position, the open hollow sections abutting masonry concrete shall be fitted with approved polysulphide sealant densely packed and finished neat.
The contractor shall be responsible for doors, windows, etc. being set straight, plumb, level and for their satisfactory/site work shop operation after fixing is complete.

Installation:
The frame shall be fixed into position true to line and level using adequate number of expansion machine bolts, anchor fasteners, of approved size and manufacture and in an approved manner. The holes in concrete/masonry members for housing anchor bolts shall be drilled with an electric drill.
The door/ windows assembled as shown on drawings shall be placed in correct final position on the opening and marks made on concrete members at jambs, sills and heads against the holes provided in frames for anchoring. The frame shall then be removed from the opening and laid aside. Neat holes with parallel sides of appropriate size shall then be drilled in the concrete members with an electric drill at the marking to house the expansion blots. The expansion bolts shall then be inserted in the holes, struck with a light hammer till the nut is forced into the anchor shell. The frame shall then be placed in final position in the opening and anchored to the support thought cadmium plated machine screws of required size and

anchored to the support through cadmium plated machine screws of required size threaded to expansion bolts. The frame shall be set in the opening by using wooden wedges at supports and be plumbed in position. The wedges shall invariably be placed at the meeting at points of glazing bars and frame.

EPDM Rubber / Neoprene gaskets: The contractor shall provide and install EPDM Rubber / Neoprene gaskets of approved size and profile at all locations as shown and as called for to render the doors, windows etc. absolutely airtight and weather tight. The contractor shall produce samples of the gaskets for approval and shall procure the same after approval only.

Fittings: Hinges, stays, handles, tower bolts, locks and other fittings shall be of quality and manufacturer as approved by the Engineer-in-Charge.

Manufacturer `s Attendance: The manufacturer immediately prior to the commencement of glazing shall adjust and set all windows and doors and accept responsibility for the satisfactory working of the opening frames.

GLAZING WORK

Glazing in doors, windows, ventilators shutters etc shall be with 6 mm thick High performance toughened glass/ Double glazed dual sealed insulated glass (6T+12A+6T) with norton tape, silicon structural sealant and weather proofing sealant complete as per the direction of Engineer-in-Charge and GFC drawings.

Details of different type of glazing is as follow:-

6 mm thick High performance toughened glass: Providing and fixing 6 mm thick high performance toughened glass of approved make with coating on face 2 in door, window, ventilator shutters etc. complete as per GFC drawings and the directions of Engineer-in-Charge shall be within the scope of work. The glass shall be fixed with necessary EPDM rubber/neoprene gasket of the approved colour, make, size and shape with silicone sealant of neural grade.

1) Light Transmission – 64% to 68%
2) Reflection (Ext.) –18% to 22%
3) Reflection (Int.) –18% to 25%
4) Solar factor –0.67 to 0.70
5) U value –5.5 to 5.8 W/Sqm K.

Installation:-

The glass shall be cut exact size, toughened and brought to site for installation. The glass panes shall be so cut that it fits slightly loose in the frames. Glazing shall be provided on the outside of the frame unless otherwise specified. Before fixing the glass all joints and glazing pockets to be cleaned by removing all foreign matter and contaminants such as grease, oil, dust, water, frost, surface dirt or glazing compounds and protective coatings.

Fixing of glass panes may be done with Aluminium / uPVC beading/ section as shown in shop drawings or as directed by the Engineer-in-Charge.

SAMPLES /SHOP DRAWINGS:
The contractor shall submit samples & shop drawings based on the GFC drawing for approval of Engineer-in-Charge before execution of work

Flooring & Dado / Cladding:
General (applicable for all kinds of flooring and dado / cladding works under this sub- head):
1. The work under this sub-head in general shall be carried out as per the CPWD Specifications, as per the architectural drawings and as per the direction of Engineer- in-Charge.

2. The Engineer-in-Charge or his representative may, if required, visit the source of supply of the various stones to assess the quality as well as availability of the material in the required quantities. The Department shall bear the cost of such visits of the officers of the Department.

3. Based on the samples approved by the Engineer-in-Charge for various flooring and dado /cladding materials as specified hereinafter, the contractor shall prepare mock up(s) at site of work as specified under relevant flooring and dado / cladding items, for approval of quality of workmanship and material specified. If the quality of the workmanship and the material is as per the required standards and approved by the Engineer-in- Charge, the mock up shall be allowed as part of the work and measured for payment. Otherwise, it shall be dismantled by the contractor as directed by the Engineer-in-Charge and taken away from the site of the work at his own cost. The mock up(s) so made shall be kept till completion of respective works for reference. Nothing extra shall be payable on this account.

4. The stones / tiles shall be transported to site well packed in boxes or otherwise. These shall be handled carefully to prevent any damage. The various types of stones and tiles, procured shall be free of any surface defect or any edge damage. The damaged stones and tiles shall not be allowed to be used in the work. So, the contactor shall procure additional quantity of the stone and tiles to cover such contingencies. However, nothing extra shall be payable on this account.

For the enclosures with circular or curved profile, only the actual area of the flooring shall be measured for payment and nothing extra shall be payable for labour, material, wastages and any other incidental charges.

6. For the skirting in the enclosures with curvilinear profiles, the tiles / stones shall be cut to the required size and the shape to match the profile and/ or the joints as per the architectural drawings. Similarly, the skirting shall be fixed in a manner as to flush or project from the finished face of the wall as per the architectural drawings and as directed by the Engineer – in– Charge. Any chasing of the CC/Brick masonry works required for such fixing is deemed to be included in the cost of masonry. Nothing extra shall be payable on this account.

7. For flooring work, the joints between the different types of flooring shall be located as per the architectural drawings and the measurement shall be done as per item description. Also, the Contractor shall maintain the uniform level of the finished flooring of the different type unless specifically mentioned on the architectural drawings. Nothing extra shall be payable on these accounts.

8. All the flooring works specified under this sub-head shall be adequately protected by a layer of plaster of Paris which shall be laid over a 400 micron PVC film. The protective layer shall be maintained throughout the execution of works and removed just before handing over of the site for which nothing extra shall be payable.

9. At the time of handing over, flooring & dado / cladding shall be free of any scratches, stain sect. The flooring & dado / cladding shall be properly cleaned before handing over. However, abrasive cleaners shall not be used to clean the marks and other scratches.

Granite stone work:

1. The Contractor shall procure and submit the samples of different types of granite stones, for the approval of the Engineer-in-charge prior to the execution of the item.

2. The mock up (one each) shall be prepared in staircase, lift wall and lift lobby, kitchen counter and window sill.

3. The entire supply for each type of granite stone slab shall be procured from one location (in one quarry), and supplied preferably, in one lot to keep variations to the minimum. The Contractor shall also segregate and sort the slabs according to color, shade, texture and size of grains etc. to keep variation(s) in stones used at any one location to the minimum. Any slab with variation in the color, shade, texture and size of grains etc., not acceptable to the Engineer-in-Charge, shall not be used in the work and shall be removed and replaced by the Contractor. Nothing extra shall be payable on these accounts. Also no claim of any kind shall be entertained from the Contractor on this account.

4. Granite stone slabs shall be pre polished (mirror polished) or given any other surface treatment as specified in the item nomenclature, as per the Architectural drawings and as directed by the Engineer-in-Charge.

5. Machine polishing and cutting to required size shall be done with water (as lubricant) only. Sawing shall also be done preferably with water as lubricant but as a special case, the Engineer-in-Charge may permit, at his discretion, oil or kerosene as lubricant subject to all kerosene or oil in the body and surface of tiles / slabs being thoroughly dried in ovens. Tiles /slabs with stains or patches due to the use of oil or otherwise, either before or after installation, shall be rejected and shall be replaced by the Contractor at his own cost. Nothing extra shall be payable on this account.

6. The stone work may be required to be carried out in patterns, design and / or in combination with granite stones of different colour and shade with or without borders and in combination of different stone slabs / tiles for which nothing extra shall be payable. The stones shall be provided in sizes and shapes as per the architectural drawings and wastages and incidental costs, if any, shall be deemed to be covered in the cost of the relevant items. Nothing extra shall be payable on this account.

7. For the flooring portions curved in plan, the stone slabs (at the edge) shall be cut to the required profile and shape as per the architectural drawings. Nothing extra shall be payable on this account and any consequent wastages and incidental charges on such accounts shall be deemed to be included in the cost of such items. For the purpose of payment, the actual area of granite stone shall be measured separately as specified under the relevant items.

8. The granite slabs used for providing and fixing on the tread of stairs, sills, soffits and jambs of doors, windows, ventilators and similar locations shall be in single piece unless otherwise directed by the Engineer-in-Charge. Wherever stone slab other than in single piece is allowed to be fixed, the joints shall be provided as per the architectural drawings and as per the directions of the Engineer-in-Charge. In the cabin areas, the joints in sills shall preferably be provided in line with the partition wall. Depending on the number of joints, as far as possible, the stone slabs shall be procured and fixed in slabs of equal lengths as per the architectural drawings and as directed by Engineer-in-Charge.

9. The specifications for dressing, laying, curing, finishing, measurements, rate etc. for the granite stone flooring shall be same as that of works for the Marble flooring, skirting and risers of steps under Flooring Sub Head of the CPWD Specifications. The wall lining / veneer work with granite stone shall be as per the CPWD Specifications for Marble work Sub Head.

Vitrified and Ceramic tiles work:

1. The contractor shall procure and submit the samples of approved make, shade and thickness of different types of vitrified and ceramic tiles, for the approval of the Engineer-in-charge prior to the execution of the item.

2. The mock up (one each) shall be prepared for flooring and dado, for vitrified tiles etc.

3. The entire supply for each type of tiles shall be procured from one manufacturer / authorized dealer, preferably, in one lot to keep variations to the minimum.

4. The tiling work may be required to be carried out in patterns, design and / or in combination with tiles of different colour and shade and in combination of different stone slabs / tiles for which nothing extra shall be payable. The tiles shall be provided as per the architectural drawings and wastages and incidental costs, if any, shall be deemed to be covered in the cost of the relevant items. Nothing extra shall be payable on this account.

5. For the flooring portions curved in plan, the tiles (at the edge) shall be cut to the required profile and shape as per the architectural drawings. Nothing extra shall be payable on this account and any consequent wastages and incidental charges on such accounts shall be deemed to be included in the cost of such items.

6. The Contractor shall obtain and submit to the Department the manufacturer's test certificate for compliance of various parameters for the material as per the manufacturer's specifications, with each lot of material received at site.

7. The flooring and dado / cladding should be set out such that the perimeter/ corner tiles are in excess of half a tile so that the edge panels on both the sides are of equal sizes, as far as possible. The tiles shall be cut to required size and shape in a workman like manner but with all precautions, as per the manufacturer's specifications.

8. For dado / cladding / skirting work, the tiles shall be chamfered at the meeting edges on the corners in a manner that butt edges are not visible. It shall be ensured that the edges shall be ground / filed to chamfer the edges so that the glazing layer at the edges of the tiles is not chipped off otherwise the work shall be rejected and redone by the Contractor at his own cost.

False ceiling:

General (applicable for all kinds of roofing works under this sub-head):

1. The work in general shall be carried out as per the CPWD specifications, as per the manufacturer's specifications, as per architectural drawings and as per directions of Engineer-in-Charge.

2. Various false ceiling shall be done in different levels in linear and curvilinear pattern in plan and elevation and in combination with other types of false ceiling as specified in schedule of quantities, as per the architectural drawings. However, payment shall be made under respective items.

3. The tiles and the suspension system shall be as specified in the item nomenclature. The contractor shall procure and submit the samples of tiles and grid system of approved make, for the approval of the Engineer-in-charge prior to execution of the item.

4. The Contractor shall prepare the mock-up at site for approval of material and quality of workmanship by the Engineer-in-Charge. Only after the approval of Mock-up, the Contractors shall start the mass work. If the quality of the workmanship and the material is as per the required standards and approved by the Engineer-in- Charge, the mock up shall be allowed as part of the work and measured for payment. Otherwise, it shall be dismantled by the contractor as directed by the Engineer-in- Charge and taken away from the site of the work at his own cost. The mock up(s) so made shall be kept till completion of respective works for reference. Nothing extra shall be payable on this account.

5. Once the material and mock-up are approved, the entire material (tiles as well as grid system) shall be procured from the approved manufacturer or its authorized dealer.

6. The installation shall be got done through an experienced installer, executing similar works.

- The material shall be transported to site well packed. The ceiling material procured shall be free of any surface defect, edge damage and any other such defects. The contractor shall ensure careful handling and storage and prevent any rough handling, rolling of cartons or dropping cartons to prevent any edge damage or breakage. The defective / damaged material shall not be allowed to be used in the work. So, the contactor shall procure additional quantity of material to cover such contingencies. However, nothing extra shall be payable on this account.
- Adequate care shall be taken before installation as well as afterwards till completion of the work. It shall be protected from rains, excessive humidity, chemical fumes, vibrations, dust etc. Any tile with edge damaged or crack etc. shall not be allowed to be used in the work and shall be replaced by the contractor at his own cost. Similarly, adequate care shall be taken by the contractor while placing or removing and handling the tiles so as not to cause any damage. The ceiling shall be cleaned as per manufacturer's specifications. Abrasive cleaners shall not be used to clean the marks.
- The Contractor shall obtain and submit to the Department the manufacturer's test certificate /report for compliance of the material to the relevant standards along with each lot of material supplied for the work.
- The suspension system for various types of false ceiling shall be as per item nomenclature and as per CPWD specification 2019. The false ceiling tiles shall be fixed on to coordinated suspension ceiling system with supporting grids system that fully integrates with the ceiling tiles as per manufacturer's specifications. It shall be ensured that the suspension system shall be suitable to take all designed dead, imposed and all incidental loads efficiently and shall not sag. The true line and levels for false ceiling work shall be maintained.
- The luminaries, air grills / diffusers, signages etc. shall be as far as possible independently supported to avoid any over loading of the ceiling system which may result in excessive deflection or twisting of grids. Any strengthening of grid system by providing additional hangers, fasteners, runners, cross tees etc. or providing additional bracing may be carried out as required for any specific locations or for specific purpose for which nothing extra shall be payable.
- The rate for the item of various false ceiling system shall include cost of all inputs of labor, materials, wastage if any, T&P, scaffolding, staging or any other temporary enabling structure /services etc. and all other incidental charges including making necessary cut outs for A.C diffusers, Light fittings, grills, Fire detection, alarm, sprinklers devices and fittings etc. No deduction in the area shall be made for openings nor anything extra shall be payable for making the openings. Also nothing extra shall be payable on account of any wastage in materials. Also nothing extra shall be payable on account of any strengthening of the supporting suspension system for the false ceiling, around the openings in the false ceiling by using additional hangers, fasteners, runners, cross tees, cross channels, etc. However, for the purpose of payment only the actual area of the false ceiling shall be measured in sqm.

GENERAL TERMS AND CONDITIONS

1 Except for the items, for which particular specifications are given or where it is specifically mentioned otherwise in the description of items in the schedule of quantities the work shall generally be carried out in accordance with the "CPWD specifications 2009 Vol. 1 and Vol. 2 with upto date corrections slips (hereinafter to be referred to as CPWD specifications) and instructions of Engineer-in-Charge. Wherever CPWD specifications are silent the latest IS codes/specification shall be followed.

2 The proposed building is a prestigious project and quality of work is paramount importance. Contractor shall have to engage well experienced skilled labor and deploy modern T&P and other equipment to execute the work. Many items like, stone flooring, aluminum, glazing, stainless steel, & plumbing work and other specialized works will specially require engagement of skilled workers having experience particularly in execution of such items.

3 a) The contractor (s) shall inspect the site of work before tendering and acquaint himself with the site conditions and no claim on this account shall be entertained by the department.

b) The contractor (s) shall get himself acquainted with nature and extent of the work and satisfy himself about the availability of materials from kiln or approved quarries for collection and conveyance of materials required for construction.

5. The tenderer shall see the approaches to the site. In case any approach from main road is required by the contractor, the same shall be made good, improved and maintained by the contractor at his own cost. No payment shall be made on this account.

6. The contractor shall take all precautions to avoid accidents by exhibiting necessary caution boards day and night speed limit boards red flags, red lights and providing barriers. He shall be responsible for all dangers and incidents caused to existing / new work due to negligence on his part. No hindrances shall be caused to traffic during the execution of the work.

7. Other agencies doing works related with this project may also simultaneously execute their works and the contractor shall afford necessary facilities for the same. The contractor shall leave such necessary holes, openings etc. for laying/burying in the work, pipes cables, conduits, clamps, boxes and hooks for fan clamps etc. as may be required for the other agencies. Nothing extra over the Agreement rates shall be paid for doing these.

8. Some restrictions may be imposed by the security staff etc. on the working and for movement of labor, materials etc. The contractor shall be bound to follow all such restrictions/instructions and nothing extra shall be payable on account of the same.

9. The contractor shall fully comply with all legal orders and directions of the Public or local authorities or municipality and adhere by their rules and

regulations and pay all fees and charges for which he may be liable in this regard. Nothing extra shall be paid/reimbursed for the same.

10. The building work shall be carried out in the manner complying in all respects with the requirements of the relevant bylaws and regulations of the local body under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-charge and nothing extra shall be paid on this account.

11. The contractor shall give a performance test of the entire installation(s) as per standing specifications before the work is finally accepted by making his own arrangements for water supply, electricity etc. and nothing extra whatsoever shall be payable for the same.

12. Huts for labor are not to be erected at the site of work, the contractor shall be required to provide such accommodation at a place as is acceptable to the local body and nothing extra shall be paid on this account.

13. It shall be ensured by the contractor that no electric live wire is left exposed or unattended to avoid any accidents in this regard.

14. The structural and architectural drawings shall at all times be properly co-related before executing any work.

15. The contractor shall maintain in perfect condition, all portions executed till completion of the entire work allotted to him. Where however phased delivery of work is contemplated these provisions shall apply separately to each phase.

16. **Defects Liability Period (DLP)**

16.1 Defects liability period shall be taken as twelve **(12) months** from the date of completion of the work for building as a whole, wherein all the defects shall be rectified by the contractor at his own cost.

16.2 Defects of serious nature causing inconvenience such as leakage, reverse floor slopes affecting the drainage (ponding of water), warping and opening of joints in doors and window shutters etc shall be undertaken by the contractor immediately on receipt of the complaint but not exceeding one week time, failing which the defects will be got removed at his risk and cost plus 25% as supervision and establishment charge.

16.3 All other defects notified to the contractor during the DLP shall be rectified to the entire satisfaction of Engineer-in-Charge or item replaced as soon as possible but not later than one month in any case. Failure to do so in a reasonable period the Engineer-in-Charge shall get it done at his cost plus 25% as supervision and establishment charges after final notice of 10 days. The decision of Engineer-in-Charge regarding a defect being of serious nature or otherwise shall be final and binding.

Other Terms and Conditions

1.1. Timely Completion

i. The work included in this tender is of urgent nature.

ii. The work of all components must be started simultaneously and has to be delivered together or early within the given time schedule.

iii. The contractor has to deploy the labor and supervisory staff in shifts to meet the targeted completion date. The work may be executed in extended shifts or two shifts.

iv. Number of days from the date of issue of letter of acceptance for reckoning date of start shall be as per Schedule. If the Contractor commits default in commencing the execution of the work as aforesaid, the performance guarantee shall be forfeited.

v. The contractor shall procure the required materials in advance so that there is sufficient time for testing of the materials and approval of the same before use in the work, as required.

1.2. Rates

1. Unless otherwise provided in the schedule of quantities of the work the rates tendered by the contractor shall be all inclusive and shall apply to all heights, lifts, leads and depths of the building and nothing extra shall be payable to him on this account.

2. The rates for all items of work shall, unless clearly specified otherwise, include cost of all labors, materials and other inputs involved in the execution of the item irrespective of whether they have been specifically mentioned in the tender document or not.

3. In case the same item (s) appear more than once in the schedule of work / BOQ under the same sub head or among the different subhead of works, the lowest rate quoted for that item (s) shall be considered for the particular item(s) wherever appeared in any part of BOQ / Schedule of works for the purpose of tender evaluation although web generated e-price bid may incorporate different quoted rate for same item(s) as per the quoting pattern of the tenderer. The tendered amount thus worked out shall be final &shall be binding on the contractor

4. The rates quoted by the contractor will be deemed to be inclusive of any extra expenditure of this reason. The contractor has to increase the manpower or other tools etc. to do the work as per requirement of the work at his own expenses. Nothing shall be paid on this account.

5. Other agencies may also simultaneously execute and install the works and the contractor shall afford necessary facilities for the same. The contractor shall leave such recesses, holes, openings, trenches etc. as may be required for such related works (for which inserts, sleeves, brackets, conduits, base plates, clamps etc. shall be available as specified elsewhere in the contract) and the contractor shall fix the same at the time of casting of concrete, stone work and brick work, if required, and nothing extra shall be payable on this account.
6. All material shall only be brought at site as per program finalized with the Engineer-in- Charge. Any pre-delivery of the material not required for immediate consumption shall not be accepted and thus not paid for.
7. Water tanks, taps, sanitary, water supply and drainage pipes, fittings and accessories should conform to approved manufacturers specifications where CPWD Specifications are not applicable. The contractor should get the materials (fixtures/fittings) tested from approved labs wherever required at his own cost.
8. The contractor shall be responsible for the watch and ward / guard of the buildings, safety of all fittings and fixtures including sanitary and water supply fittings and fixtures provided by him against pilferage and breakage during the period of installations and thereafter till the building is physically handed over to the client department. No extra payment shall be made on this account.
9. The rates quoted by the Contractor are deemed to be inclusive of site clearance, setting out work, profile, establishment of reference bench mark(s), taking spot levels, construction of all safety and protection devices, barriers, preparatory works, working during monsoon, working at all depths, height, lead, lift and location etc until / unless specified otherwise and any other incidental works required to complete this work. Nothing extra shall be payable on this account.

1.3. Quality and Workmanship

- The contractor shall be entirely responsible and answerable for all the works done by him regarding quality, adherence to the laid down specifications, terms and conditions, warranty/guarantee etc. and he shall be liable to bear any compensation that may be levied by the department under any of the clauses of the agreement.
- The materials having ISI mark shall have precedence over the one conforming to IS Specifications.
- The proposed is for Institute premises and quality of work is paramount importance. Contractor shall have to engage well experienced skilled labour and deploy modern T & P and other equipment to execute the work.

- Samples of all materials and fittings to be used in the work in respect of brand manufacturer and quality shall be approved from the Engineer-in-Charge, well in advance of actual execution and shall be preserved till the completion of the work.
- All materials used in the work shall be new and of good quality, conforming to the relevant specifications as per good engineering practice. All the materials proposed to be used in the work should be approved from Engineer in Charge before use in work.
- Articles bearing BIS certifications mark shall only be used unless no manufacturer has got BIS/ISI mark for the particular material. Any material/fitting whose sample has not been approved in advance and any other unapproved material brought by the contractor shall be immediately removed as soon as directed. Where the make of any particular material is not specified in the Contract document, the material shall be supplied as per makes desired by the engineer-in-charge.
- It will be the responsibility of the contractor / bidder to ensure use of genuine materials in the work. The department reserves the right to get (any / all materials / components) inspected by the manufacturer or their authorized representatives at any stage of the execution of work. If any of the materials, supplied and used in work is found spurious at any stage, then the department reserves the right to ask the contractor to replace it by genuine one and make suitable recovery till it is done, even if any payment against that material is already made.
- The contactor should get the make/TDS documents approved before procuring any material at site. The TDS/Make once approved shall not be changed without any valid recorded reasons. No material to be brought and used at site without the prior knowledge & approval of Engineer-in-Charge.
- The department may ask for any valid document like manufacturer's test certificate, document for purchase of the material, document for import/shipment of imported materials etc. as deemed fit by the engineer-in- charge to ascertain genuinely of material supplied by/used in the work by the contractor. The contractor shall remain bound to submit all such documents to the department failing which payment may not be made or if already paid may be recovered/ withheld from subsequent running account payment.
- All equipment and their components, and all the materials to be used in the work shall be suitable for the environmental conditions at the location of the work.
- The contractor shall ensure quality control measures on different aspects of construction including materials, workmanship and correct construction methodologies to be adopted. He shall have to submit quality assurance

programme within two weeks of the award of work. The quality assurance programme should include method statement for various items of work to be executed along with check lists to enforce quality control.

- The contractor shall get the source of all other materials, not specified elsewhere in the document, approved from the Engineer-in-Charge. The contractor shall stick to the approved source unless it is absolutely unavoidable. Any change shall be done with the prior approval of the Engineer-in-Charge for which tests etc. shall be done by the contractor at his own cost. Similarly, the contractor shall submit brand/ make of various materials not specified in the agreement, to be used for the approval of the Engineer-in-Charge along with samples and once approved, he shall stick to it.
- The contractor shall arrange carrying out of all tests required under the agreement through the laboratory as approved by the Engineer-in-Charge and shall bear all charges in connection therewith including fee for testing. The said cost of tests shall be borne by the contractor/department in the manner indicated below.
  a) By the contractor, if the results show that the test does not conform to relevant CPWD Specifications / BIS code or specification mentioned elsewhere in the documents.
  b) By the department, if the results conform to relevant CPWD Specifications / BIS code or specification mentioned elsewhere in the documents.
- Sample of building materials fittings and other articles required for execution of work shall be got approved from the Engineer-in-Charge. Articles manufactured by companies of repute and approved by the Engineer-in-Charge shall only be used. Articles bearing BIS certification mark shall be used in case the above are not available, the quality of samples brought by the contractor shall be judged by standards laid down in the relevant BIS specifications. All materials and articles brought by the contractor to the site for use shall conform to the samples approved by the Engineer-in-Charge which shall be preserved till the completion of the work.
- The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material/work beyond set out tolerance limit shall be summarily rejected by the Engineer-in-Charge.
- BIS marked materials except otherwise specified shall be subjected to quality test at the discretion of the Engineer-in-Charge besides testing of other materials as per the specifications described for the item/materials. Wherever BIS marked materials are brought to the site of work, the contractor shall if required, by the Engineer-in-Charge furnish manufacturers test certificate or test certificate from approved testing laboratory to establish that the material produced by the contractor for

incorporation in the work satisfies the provisions of BIS codes relevant to the material and/or the work done.

- All the material brought by the contractor for use in the work shall be got checked from the Engineer-in-Charge or his authorized representative of the work on receipt of the same at site before use.
- The contractor shall be fully responsible for the safe custody of the materials issued to him even if the materials are in double lock and key system.

1.4. Natural calamity:

No payment will be made to the contractor for any damage caused by rain, snow fall, floods, dampness, fire, sun or any other natural cause whatsoever during the execution of work. The damage to the work due to above reason, if any, shall have to be made good by the contractor at his own cost and no claim on this account shall be entertained.

1.5. Stocking and Disposal of Materials & Debris

- The contractor shall take instructions from the Engineer-in-Charge regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, compound wall, services etc. are to be constructed.
- After completion of work the agency shall remove materials and debris etc. from site as per the direction of Engineer-in-Charge, at no extra cost.
- Contractor's job will also include removing of all malba and debris arising in the process of painting including washing of floor to remove stains of paint, at no extra cost.
- The contractor shall conduct work so as not to interfere with or hinder the progress or completion of the work being performed by other contractor(s) or by the Engineer-in-Charge and shall as far as possible arrange his work and shall place and dispose of the materials being used or removed so as not to interfere with the operations of other contractor or he shall arrange his work with that of the others in an acceptable and coordinated manner and shall perform it in proper sequence to the complete satisfaction of others.
- For construction/renovation works which are likely to generate malba/rubbish to the tune of more than a tempo/truck load, contractor shall dispose of malba, rubbish & other unserviceable materials and wastes at their own cost to the notified/specified dumping ground and under no circumstances these shall be stacked/dumped, even temporarily outside the construction.

- Dismantled but useful materials/components/equipment, if any, should be returned to the Institute as per the direction of Engineer-in-Charge.
- **The dismantled materials shall not be thrown anywhere in the campus. Proper space has been marked and these shall be deposited in C & D waste site near Security Barrack only. Dumping of C & D waste in campus may attract penalty of Rs. 5000/- per tractor trolley.**

1.6 Painting

- Contractor will thoroughly clean all paint marks left here and there due to spilling and splashes of paint at no extra cost.
- Contractor will first submit the shade cards of relevant make of paint to IIT for approval of color before procuring the paint in bulk.
- No mixing will be allowed with Stainer to achieve a particular color. Contractor will procure direct colour paint of approved shade and apply directly.
- Contractor shall have to brought at least 50% quantity of total premium acrylic smooth exterior silicon additives paint and water proofing cement paint and shall deposit it in the custody of concerned site Engineer before start of work. The consumption shall be monitored by the Institute. All empty drums shall have to be kept till completion of the work.

1.7 Safety and Security

- The contractor has to follow all safety norms as laid down in National Building Code of India. All the workers shall be equipped with the required safety gadgets while working at site such as ISI marked helmets, Shoes and safety belts, gumboots, gloves etc.
- The contractor, the authorized representative(s), workmen etc., shall strictly observe orders pertaining to fire precautions prevailing in the area.
- The contractor shall be fully responsible for the safe custody of materials brought by him/ issued to him even though the materials may be under double lock key system.
- Contractor will arrange proper metal ladders, M.S. double scaffolding (for working, painting, etc. at higher levels) at his own cost and will take all safety measures like double harness safety belt, mechanized electrically operated platform etc. If it is observed that work is proceeding without adequate safety precautions, work may be stopped by Engineer-in- charge and in such cases, contractor will be solely responsible for delay and its consequences thereof.
- The contractor shall be responsible for the watch and ward/guard of the

buildings, safety of all fittings and fixtures including sanitary and water supply fittings and fixtures provided by him against pilferage and breakage during the period of installations and thereafter till the building is physically handed over to the department. No extra payment shall be made on this account.

- The contractor shall take all precautions to avoid accidents by exhibiting necessary caution boards day and night speed limit boards red flags, red lights and providing barriers. He shall be responsible for all dangers and incidents caused to existing / new work due to negligence on his part. No hindrances shall be caused to traffic during the execution of the work.
- It shall be ensured by the contractor that no electric live wire is left exposed or unattended to avoid any accidents in this regard.
- The Institute shall not have any responsibility or liability in case of any accident injury to the personnel to the contractor at work site or to the general public at the work site due to mishandling equipment by the personnel of the contractor or any other similar reason. The responsibilities and liabilities for such accidents and incidents shall be borne by the contractor.

1.8 Approach to Site

- The tenderer shall see the approaches to the site. In case any approach from main road is required at site or existing approach is to be improved and maintained for cartage of materials by the contractor, the same shall be provided, improved and maintained by the contractor at his own cost.
- Contractor shall take all precautionary measures to avoid any damage to adjoining property. All necessary arrangement shall be made at his own cost.

1.9 Water and Flooding

- For works below ground level the contractor shall keep that area free from water. If dewatering or bailing out of water is required the contractor shall do it and nothing extra shall be paid except otherwise provided in the items of schedule of quantity.
- In case of flooding of site on account of rain or any other cause and any consequent damage, whatsoever, no claim financially or otherwise shall be entertained not withstanding any other provisions elsewhere in the contract agreement. Also, the Contractor shall make good, at his own cost, the damages caused, if any.
- The water charges @ 1% (for water connection) shall be borne by the contractor.

1.10 Acts and Laws

- The Contractor shall keep himself fully informed of all acts and laws of the Central & State Governments, all orders, decrees of statutory bodies, tribunals having any jurisdiction or authority, which in any manner may affect those engaged or employed and anything related to carrying out the work. All the rules & regulations and bye-laws laid down by Collector / MC etc. and any other statutory bodies shall be adhered to, by the contractor, during the execution of work.
- The Contractor shall also adhere to all traffic restrictions notified by the local authorities.
- All statutory taxes, levies, charges (including water and sewerage charges, charges for temporary service connections and / or any other charges, as applicable) payable to such authorities for carrying out the work, shall be borne by the Contractor.
- The Contractor shall arrange to give all notices as required by any statutory / regulatory authority and shall pay to such authority all the fees that is required to be paid for the execution of work. He shall protect and indemnify the Institute and its officials & employees against any claim and /or liability arising out of violations of any such laws, ordinances, orders, decrees, by himself/herself or by his/her employees or his/her authorized representatives. Nothing extra shall be payable on these accounts.
- The fee payable to statutory authorities for obtaining the various permanent service shall be borne by the Institute.

1.11 Labour and Laws

- The Contractor shall display all permissions, licenses, registration certificates, bar charts, other statements etc. under various labour laws and other regulations applicable to the works, at his site office.
- Huts for labour are not permitted within the premises of the Institute. No extra cost shall be payable even if the contractor provides such accommodation at a place as is acceptable to the local body.

1.12 Nondisclosure Agreement.

- The Agency shall take all precautions not to disclose, divulge and/or disseminate to any third party any confidential information, proprietary information on the Institute business or security arrangements (including but not limited to the Assignment instructions, Schedules and other subsequent Arrangements) and/or business of the Institute. The obligation

is not limited to any Scope and the Agency shall be held responsible in case of beach of the confidentiality of Institute's information.

- If the Agency receives enquiries from Press/Media/Radio/Television or other bodies / persons, the same shall be referred by the Agency to Institute immediately on receipt of such queries.

1.13 Indemnification:

- The agency shall be directly responsible to indemnify the Institute against all charges, dues, claims, etc. arising out of the disputes relating to the dues and employment of the personnel deployed and further for any claim/compensation against all damages and accidents caused due to negligence on the part of the agents, employees and other personnel of the agency.
- That the contractor shall keep the IITK indemnified against all claims whatsoever in respect of the employees deployed by the contractor. In case any employee of the contractor so deployed enters in dispute of any nature whatsoever, it will be the primarily responsibility of the contractor to contest the same. In case IITK is made party and is supposed to contest the case, IITK will be reimbursed for the actual expenses incurred towards Counsel Fee and other expenses which shall be paid in advance by the Contractor to IITK on demand. Further, the contractor shall ensure that no financial or Any other liability comes on IITK in this respect of any nature whatsoever and shall keep IITK indemnified in this respect.

1.14 Force Majeure:

- If at any time, during the continuance of this contract, the performance in whole or in part by either party of any obligation under this contract is prevented or delayed by reasons of any war, hostility, acts of public enemy, civil commotion, sabotage, fires, floods, explosion, epidemics quarantine restriction, strikes, lockouts or acts of god (hereinafter referred to as events) provided notice of happenings of any such event, is served by party seeking concession to the other as soon as practicable, but within 21 days from the date of occurrence and termination thereof. Provided the Party satisfies Institute adequately of the measures taken by it. Neither party shall, by reason of such event, be entitled to terminate this contract, nor shall either party have any claim for damages against the' other in respect of such non-performance or delay in performance. Further, the services under the contract shall be resumed as soon as practicable after such event has come to an end or ceased to exist and the decision of Institute as to whether the services have to resume or not shall be final and conclusive,

provided further, that if the performance in whole or in part of any obligation under this contract is prevented or delayed by reason of any such event for a period exceeding 60 days, Institute may at his option, terminate the contract.

1.15 Dispute resolution

- The institute reserves the right to amend rules whenever and wherever considered necessary and appropriate. The same shall be intimated to the agency in due course.
- Any dispute arising out of and in relation to this agreement shall be referred to the arbitration by sole arbitrator to be appointed by Director of the Institute. The arbitration would be conducted and governed by and under the provisions of Arbitration Act, 1996 and its amendments. Any legal dispute will be subject to jurisdiction of Kanpur Courts only and no other court shall have the jurisdiction.

1.16 Arbitration

- Except as otherwise provided anywhere in this Agreement, if any Except as otherwise provided anywhere in this Agreement, if any dispute, difference, the question of disagreement or matter, whatsoever, arises between the parties, as to the meaning, operation or effect of the Agreement or out of or relating to the Agreement or breach thereof, the same shall be referred to a Sole Arbitrator, to be appointment by the Director of the Institute at the time of the dispute.
- If the Arbitrator, to whom the matter is originally referred, dies or refuses to act or resigns for any reasons from the position of arbitration, it shall be lawful for the Director of the Institute to appoint another person to act as Arbitrator in the manner aforesaid. Such person shall be entitled to proceed with the reference from the stage at which it was left by its predecessor, provided both the parties consent to this effect, failing which, the arbitrator shall be entitled to proceed on the matter de-novo.
- It is a term of the Agreement that the party invoking the arbitration shall specify all disputes to be referred to arbitration at the time of invocation of arbitration under the clause.
- It is a term of the contract that the cost of arbitration shall be borne by the parties themselves.

- The place of the arbitration shall be Kanpur Nagar, Uttar Pradesh, India.
- Subject as aforesaid, the provisions of the Arbitration and Conciliation Act, 1996 and any statutory modifications, amendments or re-enactment thereof and rules made the reunder and for the time being in force, shall apply to the arbitration proceeding under this clause.
- Except as otherwise provided anywhere in this Agreement, the Arbitration proceedings shall be conducted in English and the Agreement shall be constructed, interpreted and governed by the law of India, for the time being in force.

1.17 Jurisdiction of Courts

- The court(s) at Kanpur Nagar, Uttar Pradesh, shall have the exclusive jurisdiction to try any asall the disputes(s) between the parties arising out this Agreement.
- On completion of work, the contractor shall submit at his own cost four prints of "as built" drawings to the Engineer-in-Charge within 30 days of completion of work.

1.18 Personal Safety Measures for Labor:

Contractor shall provide the following items for safety of workers employed by contractor and associate agencies:

(i) Protective footwear / helmet and gloves to all workers employed for the work on mixing, cement, lime mortars, concrete etc. and openings in water pipeline/sewer line.

(ii) Welder's protective eye-shields to workers who are engaged in welding works.

(iii) Safety helmet and Safety harness/ belt Provide adequate sanitation/safety facilities for construction workers to ensure the health and safety of the workers during construction, with effective provisions for the basic facilities such as sanitation, drinking water and safety equipment's or machinery.

(iv) All the workers should be wearing helmet and shoes all the time on site.

(v) Masks and gloves should be worn whenever and wherever required.

(vi) Adequate drinking water facility should be provided at site, adequate number of decentralized latrines and urinals to be provided for construction workers.

(vii) First aid facility should also be provided.

(viii) Overhead lifting of heavy materials should be avoided. Barrow wheel and hand-lift boxes should be used to transport materials onsite.

(ix) Tobacco and cigarette smoking should be prohibited onsite.

(x) All dangerous parts of machinery are well guarded and all precautions for working on machinery are taken.

(xi) Ensure that walking surfaces or boards at height are of sound construction and are provided with safety rails and belts. Provide protective equipment's such as helmets.

(xii) Comply with the safety procedure, norms and guidelines (as applicable) as outlined in NBC 2005 (BIS 2005c). All workers shall be provided regular safety training by the designated safety officer of the contractor before allowing them to work at site.

(xiii) Adopt additional best practices and prescribed norms as in NBC 2005 (BIS2005).

SPECIAL CONDITIONS

1. The contractor shall execute the whole work in the most substantial and workmanlike manner in strict accordance with the specifications, approved design, drawings, particular specifications, special conditions, additional conditions and instructions of the Engineer-in-Charge.
2. Before tendering, the contractor shall inspect the site of work and structures and shall fully acquaint himself about the conditions prevailing at site, availability of materials, availability of land and suitable location for construction of go-downs, stores, site office, transport facilities, constraints of space for establishing design mix plants, weather condition at site, the extent of leads and lifts involved in execution of work etc., which may affect or influence the tenders. No claim whatsoever on account of above factors shall be entertained.
3. It shall be deemed that the contractor has satisfied himself as to the nature and location of the work, availability of labour, materials, transport facilities, availability and suitability of land for setting up of camp, etc with respect to the work to be executed. The department will bear no responsibility for lack of such knowledge and the consequences thereof.
4. The contractor shall have to make approaches to the site, if so required and keep them in good condition for transportation of labour and materials as well as inspection of works by the Engineer-in-Charge. Nothing extra shall be paid on this account.
5. The contractor shall carry out true and proper setting out of the work in co-ordination with the Engineer-in-Charge or his authorized representatives and shall be responsible for the correctness of the positions, levels, dimensions and alignment of all parts of the structure. If at any time during the progress of the work any error appears or arises in the position, level, dimensions or alignment of any part of the work, the contractor shall rectify such error to the entire satisfaction of Engineer-in-charge. The checking by the Engineer-in-Charge or his authorized representatives shall not relieve the contractor of his responsibility for the correctness of any setting out of any line or level. The contractor shall carefully protect and preserve all bench marks, pegs and pillars provided for setting out of works. Nothing extra shall be paid on this account.
6. The work shall be carried out in such a manner so as not to interfere or adversely affect or disturb other works being executed by other agencies, if any.
7. Any damage done by the contractor to any existing works or work being executed by other agencies shall be made good by him at his own cost.
8. The work shall be carried out in the manner complying in all respects with the requirement of relevant rules and regulations of the local bodies under the jurisdiction of which the work is to be executed and nothing extra shall be paid on this account.
9. The contractor may have to work in two or more shifts for completing the work in time, and no claims whatsoever shall be entertained on this account, notwithstanding the fact that the contractor will have to pay or may have paid to the labourers and other staff engaged directly or indirectly on the work according to the provisions of

the labour regulations and the agreement entered upon and/or extra amount for any other reasons.

10. The works to be governed by this contract shall cover delivery and transportation up to destination, safe custody at site, insurance, erection, testing and commissioning of the entire works.

11. No payment shall be made to the contractor for damage caused by rain, whatsoever during the execution of works and any damage to the work on this account shall have to be made good by the contractor at his own cost.

12. The rates tendered by the contractor shall be all inclusive and shall apply to all heights, lifts, leads and depths of the building and nothing extra shall be payable to him on this account.

13. No claim whatsoever for idle labour, additional establishments, costs of hire and labour charges for tools and plants, scaffolding etc, would be entertained under any circumstances. Similarly it is term of the contract that if the work gets delayed due to any site hindrance like trees, service lines, or for any other reasonable cause whatsoever only suitable extension of time for the contract shall be given but no claims whatsoever including claims of idle labour, idle machinery, cost of idle establishment, loss of profit etc on the ground of extension of contract beyond stipulated period shall be entertained even if the Extension is granted without levy of compensation by the Engineer in charge.

14. The Contractor(s) shall take all precautions to avoid accidents by exhibiting necessary caution boards day and night, speed limit boards, red flags, red lights and providing safety nets (Safety to labours in case of fall from height), safety belts etc and other safety norms as specified in the general conditions of contract. In case of any accident of labours/ contractual staffs/third party the entire responsibility will rest on the part of the contractor and any compensation under such circumstances, if becomes payable, shall be entirely borne by the contractor. The contractor shall be keep the department indemnified against any claim generated on any such account at all times.

15. Scaffolding: Wherever required for the execution of work, all the scaffolding shall be provided and suitably fixed, by the Contractor. It shall be provided strictly with steel scaffolding system until specifically got approved otherwise from Engineer in charge , suitably braced for stability, with all the accessories, gangways, etc. with adjustable suitable working platforms to access the areas with ease for working and inspection. It shall be designed to take all incidental loads. It should cater to the safety features for workmen. It shall be ensured that no damage is caused to any structure due to the scaffolding. Nothing extra shall be payable on this account.

16. Royalty if any payable and all other incidental expenditure shall have to be paid by the contractor on all the boulders, metal shingle, earth, sand bajri, etc. collected by him for the execution of the work, direct to the concerned Revenue Authority of the State or Central Govt. and the amount paid shall not be reimbursed in any form whatsoever.

17. Other agencies working at site may also simultaneously execute the works entrusted to them and to facilitate their working, the contractor shall make necessary provisions e.g. holes, openings, etc. for laying/burying pipes, cables, conduits, clamps, hooks, etc. as may be required from time to time. Nothing extra over the agreement rates shall be paid for doing this. The required materials/fixtures shall however be provided by department. Similarly other nearby projects may also be in progress in the campus and thus all reasonable coordination and assistance needs to be extended in order to avoid any hindrance to the nearby works. The contractor shall extend full co-operation to other agencies for smooth execution of works by other agencies. The final finishing of the work is to be executed in co-ordination with other agencies as directed by the Engineer-in-Charge.

18. Stacking of materials and excavated earth shall be done as per the directions of the Engineer-in-Charge. Double handling of materials or excavated earth if required shall have to be done by the contractor at his own cost.

19. The amount quoted shall be considered as inclusive of pumping/baling out water, if necessary, and no extra payment shall be made for pumping/baling out water. This includes water from any source such as rain, broken water mains or drains and seepage, surface and sub-soil water, rain etc. and shall apply to the execution in any season.

20. The contractor shall give a performance test of the entire installation(s) as per specifications before the work is finally accepted by making his own arrangements for water supply, electricity etc and nothing extra whatsoever shall be payable to the contractor for the performance test.

21. The steel work in railing includes fish tailing of the section to be embedded in concrete and fixing the same.

22. The contractor shall arrange to keep the premises neat and clean. The rubbish/malba and unserviceable materials shall be removed on day to day basis.

List for Preferred Makes (Civil Works):

Public Procurement (Preference to Make in India) Order (PPP-MIII Order)-2017- Revision dated 29-05-2019 and DoT Public Procurement (Preference to Make in India) Order (PPP-MII Order) dated 29-08-2018 with upto date amendments shall be strictly complied with in all cases and prevail.

Preferred Brands names of materials, whichever are applicable for the scope of work are listed below. The list is indicative and for guidance purpose only. Approved equivalent materials of any other specialized firms may also be used subject to approval of the alternate brands by the Engineer-in-Charge, provided they satisfy the tender specification in all respect (See also conditions of contract).

Sl. No.	**Material description**	**Manufacturer / Brand Name**
1.	Ready Mix Concrete	Ultratech Concrete, ACC Ready Mix and RMC India
2.	Cement (PPC/OPC)	ACC, Ultratech, Vikram, Shree Cement, Abuja, JK Cement, Century Cement, Jaypee Cement & Prism Cement.
3.	White Cement	Birla White, J.K. White
4.	Reinforcement Steel	SAIL, Tata Steel Ltd, RINL, Jindal Steel & Power Ltd. and JSW Steel Ltd
5.	Waterproofing compounds, admixtures, plasticizer, super plasticizer, curing compounds	Fosroc, ROFF/Dr. Fixit (Pidilite Industries), STP Ltd., Sika, BASF, Ardex Endura & Parma Construction Aids Pvt. Ltd.
6.	Integral water proofing compound with cement (for plaster & mortar)	Fosroc: Conplast 421, Dr. Fixit : LW+, Sika: Sikacim, Asian Paint: SmartCare Vitalia & equivalent product of BASF, STP Ltd., Ardex Endura, Perma Construction Aids Pvt. Ltd.
7.	Water proofing compound for bathroom/ toilet /balcony & other wet area	Fosroc: Bush Bond, STP Ltd.: Shalicrete, CICO: Tapecrete, Dr. Fixit : Pidifine 2K, Sika : Topseal 107, Asian Paints: Damp Block 2K & equivalent
8.	Crystalline water proofing compound	Product of BASF, Ardex Endura, Perma Con-struction Aids Pvt. Ltd. Fosroc: Bushbond TGP, Dr. Fixit : Dr. Fixit Krystalline, Sika: Sika 101h, Asian Paints: SmartCare & equivalent product of BASF, Ar- dex Endura, STP Ltd., Perma Construction Aids Pvt.
9.	Grouts, Tile Adhesive	Laticrete, STP Ltd., Kajaria, BASF, Perma, Ardex Endura, JK White & Ferrous Crete.
10.	Structural steel	SAIL, Tata Steel, Rashtriya Ispat Nigam Ltd. (RINL), JSW Steel Ltd., Jindal Steel & Power Ltd.
11.	Polycarbonate sheet	GE Plastic, LEXAN & MG Polyplast

12.	Profile steel sheet	Ezydeck of TATA, Lloyd Superdeck, JSW, Jindal
13.	Particle board	Action TESA, Merino, Archidply & Orion Doors
14.	Laminates	Action TESA, Greenlam, Century Ply, Merino, Archidply, Virgo & Orion doors
15.	Flush door shutters	Duro, Century, Durian, Archidply, Green Ply, JAYNA (Jain Wood Industries), Jain Doors Pvt. Ltd., GREENPANEL & Orion Doors Note: Only ISI marked flush door shutters to be used.
16.	Fire rated doors	Signum fire protection, Shakti Metdoor, NAVAIR, Promat, Thrislington, Sukri & Bhawani. If fire rated glass is integral part of fire rated door than it should be of one of the following makes: Pyroguard, Saint Gobain,Asahi India, Pilkington & Schott
17.	False ceiling system	Armstrong, USG Boral, Saint Gobain, Aerolite, Interarch, Hi- steel of PR Ceiling Products,Anutone
18.	Plywood / Veneer	Greenply, Century, Merino, Durian, Archidply, GREENPANEL & Orion Doors.
19.	Melamine polish	Asian Paints melamine gold, Wudfin of Pidilite & Timbertone of ICI dulux.
20.	Floor spring & door closer	Godrej, Dormakaba, Dorset, Kich or as per BoQ
21.	Aluminum section	Hindalco, Jindal & Indian Aluminium Co. as per BoQ
22.	Anodized aluminum hardware (Heavy Duty)	Kilon, Alualpha, Classic & Ebco.
23.	Clear / Float/Frosted/Toughen Glass/ Refractive glass	Saint Gobain, AIS & Modiguard
24.	Stainless steel railing, Accessories etc.	JINDAL, Dormakaba, Kich, GEZE, Godrej & Hardwyn
25.	SS fittings for doors & window	Jindal, Dormakaba, Kich, Dorset, Godrej, Ozone& Define
26.	Silicon based water re-pellant /weather sealant	GE Plastics, STP Ltd., Dow Corning, Waker, BASF & Pidilite (Dr. Fixit/ Roff
27.	Poly-Sulphide Sealant	Fosroc, STP Ltd., Pidilite (Dr. Fixit/Roff), Sika & BASF
28.	Mosaic tiles/ChequeredTiles	Ultra Tiles, NITCO, Hyper, Mayur & Pavcon,
29.	Glazed Ceramic Tiles	Kajaria, NITCO, Orient Bell, Johnson, Somany, RAK & Varmora

30.	Vitrified Tiles (Antiskid /Matt /Glazed)	Kajaria, NITCO, Orient Bell, Johnson, Somany, RAK, Varmora & Restile or as per BoQ
31.	Paver block & Kerbstone	Pavcon, Hyper, Mayur, KK, Power, Sharda & Navya
32.	Cement Based wallputty	Asian Paints, Birla Wall Care, JK, White & Berger
33.	Oil bound washable dis temper / dry distemper	Asian Paints (Professional Acrylic Distemper), Nerolac: Beauty Acrylic Distemper, Berger: Bison Acrylic Distemper& Dulux ICI: Maxilite
34.	1st quality acrylic distemper (washable/ ready mix / Low VOC)	Asian Paints (Tractor Aqua Lock Paint), Berger: Commando or equivalent paints of Nerolac & ICI-Dulux
35.	Acrylic emulsion paints	Asian Paints: (Professional Premium Interior, Emulsion Paint), Nerolac: Beauty Gold, Berger: Rangoli Total Care & ICI Dulux: Super Cover,Indigo
36.	Plastic emulsion paint	Asian Paints: (Apcolite Heavy Duty Premium Emulsion Paint), Nerolac: Impression, Berger: Easy Clean & ICI Dulux: 3 in 1
37.	Premium acrylic emulsion paints (Interior)	Asian Paints: (Royale Luxury Emulsion), Nerolac: Impression, Berger: Silk & ICI Dulux: Velvet Touch, Indigo
38.	Textured exterior paint	Asian Paints, Nerolac, Berger Paints, Ultratech Paints &Luxture
39.	Acrylic smooth exterior paint	Asian Paints: (Apex/Professional Premium Exterior Emulsion), Nerolac: XL, Berger: Weather Coat & ICI Dulux: Weather Shield, Indigo
40.	Premium acrylic smooth exterior paint with sil- icon additive	Asian Paints: Apex Ultima, Nerolac: XL total, Berger: Weather Coat all Guard & ICI Dulux : Weather Shield Max
41.	Synthetic Enamel Paint	Asian Paints: Apcolite Premium Gloss Enamel, Nerolac: Synthetic Hi gloss, Berger: Luxol Hi gloss & ICI Dulux: Gloss Synthtic enamel.

42.	Cement Primer	Nerolac, Berger (BP white), STP Ltd., Asian (Decoprime WT) & ICI (White primer).
43.	Steel primer (Red Oxide Zinc Chromate Primer)	Asian Paints, Nerolac, Berger & ICI
44.	Wood primer	Asian Paints (wood primer - White/Pink), Burger, ICI & Nerolac
45.	Epoxy paint	Asian Paints, STP Ltd., Nerolac, Berger, ICI, Kansai, & Akzo Nobel
46.	Fire paint	Asian paint, STP Ltd., Akzo Nobel, PROMAT, & JOTUN
47.	GI/MS Pipe	Tata, Jindal (Hisar) & Prakash Surya
48.	GI Fittings	Unik, AVR & Zoloto
49.	HDPE Pipes	Reliance, Jain Pipes, ORIPLAST & Supreme
50.	DI Pipes & fittings	Electrosteel, Jindal, TATA DUCTURA, Kapil Ansh & & Kesoram
51.	UPVC pipe and fittings	Astral, Supreme, Prince, M/s Skipper Ltd, Ashirwad &Prayag Polymers Pvt. Ltd
52.	SW Pipes (BIS ap- proved)	Anand, Parry & Perfect
53.	Centrifugally Cast (Spun) Iron Pipes & Fittings /Hub less pipes& fittings	NECO, BIC,Kapilansh, SKF, Raj Pattern Makers & Founders Pvt. Ltd. or any other ISI marked make
54.	CI Manhole covers, frames & GI Gratings	NECO, BIC, SKF & Kapilansh,
55.	SFRC Manhole covers & gratings	K K Jain & Pragati
56.	CP brass fittings (Superior range)	Jaquar, Grohe & Roka.
57.	CP brass fittings (Nor- mal Range)	ESSCO (by Jaquar), JAL Brand, Euronix, CERA, Johnson & Prayag Polymers Pvt. Ltd.

58.	Sanitary ware, fittings & accessories	Kerovit (Kajaria), CERA, Jaquar, Parryware, Hindware & Prayag Polymers Pvt. Ltd.
59.	Mirror glass	Atul, Modi Guard & Golden Fish
60.	CPVC Pipe & fitting	Astral, Superme, Prince, M/s Skipper Ltd., Ashirwad & Prayag Polymers Pvt. Ltd.
61.	Stainless steel sink	Neelkanth, Niralli, Jyna & Prayag Polymers Pvt. Ltd.
62.	FRP doors shutters & frame	Jayna, Fiberways, Jain Doors Pvt. Ltd. & Selected Product Co,
63.	Extruded polystyrene insulation board	Dowcorning, Supreme, Texas & Analco
64.	Gypsum plaster	Ferrous Crete, Gyproc Saint Gobain, Ultra Tech & J K White
65.	Floor hardener	Ironite, Perma, STP Ltd., Ferrok & Hardonate
66.	Modular Expansion Joint	Herculus, Sanfield India Ltd & Vexcolt
67.	Glass Wool	Dow Corning, UP Twiga & Isover
68.	uPVC door/window/ventilator	Fenesta, Komerling, Rheau, Veka,
69.	uPVC doors and win-dow hardware	Manufacturer or his authorized fabricator). Roto, Dorset, DNV Accado & Kinlong
70.	AAC block Adhesive	UltraTech, Perma, Ardex Endura & Ferrous Crete
71.	PVC Water Tank	Syntex & Vectus
72.	AAC Block	MAX Blocks, UltraTech, HIL & BILTECH ACE & Gravit
73.	Modular Kitchen	Everyday/Hettich/Steel Art Brand Baskets of AISI 304(18/8); Hettich/Hafele Brand Auto closing, Concealed Hinges; DMS/ Dynasty/ Indoline brand shutter

74.	Aluminum shuttering	Knest, S-form, Durand Forms (India) Pvt. Ltd. & Mivan
75.	MS Tubular windows & Pressed Steel door frames	Jangid Engineering Works, AGFUV, Sen Harvic, Navair Delhi & Sukriti Delhi
76.	Dash fasteners /Anchors	Hilti, Bosch & Fischer

Form of Performance Security (Guarantee)

BANK GUARANTEE BOND

1. In consideration of the President of India (hereinafter called " the Government") having agreed under the terms and conditions of agreement No._____ dated _____made between_____and_____(hereinafter called "the contractor(s)")_____for the work_____(hereinafter called "the said agreement") having agreed to production of a irrevocable Bank Guarantee for ₹ _____ (Rupees_____only) as a security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement, we _____ (hereinafter referred to as "the Bank") hereby undertake to pay to the
(Indicate the name of the Bank)

Government an amount not exceeding ₹_____(_only) on demand by the Government.

2. We_____ do hereby undertake to pay the amounts due and payable
(Indicate the name of the Bank)
under this Guarantee without any demure, merely on a demand from the Government stating that the amount claimed is required to meet the recoveries due or likely to be due from the said contractor(s). Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding _____ _____only).

3. We, the said bank further undertake to pay to the government any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any court or tribunal relating thereto, our liability under this present being absolute and unequivocal.
The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder and the contractor(s) shall have no claim against us for making such payment.

4. We, the said bank further undertake to pay to the government any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any court or tribunal relating thereto, our liability under this present being absolute and unequivocal.
   The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder and the contractor(s) shall have no claim against us for making such payment.
5. We further agree that the guarantee herein _____ contained shall (Indicate the name of the Bank)
   remain in full force and effect during the period that would be taken for performance of the said agreement and that it shall continue to be enforceable till all the dues of the Government under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till Engineer-in-charge on behalf of the government certified that the terms and conditions of the said agreement have been fully and properly carried out by the said contractor(s) and accordingly discharges this guarantee.

6. We further agree with the Government that _____ the Government (Indicate the name of the Bank) shall have the fullest liberty without our consent and without effecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the government against the said contractor(s) and to forebear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said contractor(s) or for any forbearance, act of omission on the part of the government or any indulgence by the Government to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.
7. This guarantee will not be discharged due to the change in the constitution of the Bank or the contractor(s).

8. We lastly undertake not to revoke this guarantee _____ except with (Indicate the name of the Bank) the previous consent of the Government in writing.
9. This guarantee shall be valid up to _____, unless extended on demand by Government. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to (₹_____only) and unless a claim in writing is lodged with us within six months of the date of expiry or the extended date of expiry of this guarantee all our liabilities under this guarantee shall stand discharged.

Dated the _____ day of or _____

(Indicate the name of the Bank)

This Guarantee will remain in force up to and including the date ……* ..... after the deadline for submission of tender as such deadline is stated in the Instructions to contractor or as it may be extended by the Engineer-in-Charge, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE ..... SIGNATURE OF THE BANK

WITNESS ..... SEAL

(SIGNATURE, NAME AND ADDRESS)

*Date to be worked out on the basis of validity period of 6 months from last date of receipt of tender.

केन्द्रीय लोक निर्माण विभाग

कार्यालय ज्ञापन

No. DG/MAN/410

ISSUED BY AUTHORITY OF DIRECTOR GENERAL, CPWD

NIRMAN BHAWAN, NEW DELHI DATED: 22.10.2021

Subject: Addition of new Para 4.10.2 in CPWD Works Manual 2019 regarding testing charges to be borne by contractor.

It has been noticed that following provisions are sometimes being made in the NITs / Agreements by the NIT approving authorities:

"The cost of test shall be borne by contractor/ department in the manner as below:

i. By the contractor, if the result shows that material does not conform to the relevant codes/ specification.

ii. By the department, if the results show that the material conforms to relevant codes/ specification."

It has been decided by the competent authority that testing charges shall be borne by the contractor in all cases. Accordingly following new para is added in CPWD Works Manual -2019.

Existing Provision	Modified Provision
4.10 Preparation of NIT	**4.10 Preparation of NIT**
4.10.2 No Provision	**4.10.2 Testing charges to be borne by contractor** **Following provision shall be incorporated by the NIT approving authority in the NIT:** **All expenditure to be incurred for testing of samples e.g. packaging, sealing, transportation, loading, unloading etc. including testing charges shall be borne by the contractor. The NIT shall have list of approved laboratories for testing as approved by ADG / SDG.**

This issues with the approval of competent authority.

(वी.पी. साहू) 22/10/2021

अपीक्षण अभियंता(सी.एंड एम.)

Issued from file No. CSQ/CM/16(1)/2021 e-file 9116587

प्रतिलिपि: सभी केलोनिवि तथा लोनिवि दिल्ली के अधिकारियों को आवश्यक सूचना एवं कार्यवाही हेतु।(केलोनिवि वेबसाईट के माध्यम से).

Electrical Work

Scope of work

Project Brief

Construction of cafeteria at VH (SH: Electrical Works). as specified in BOQ.

Specifications for Electrical Works

Specifications Medium Voltage Switchgear

1. STANDARDS AND CODES

The following 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.

BIS certified equipment shall be used as a part of the Contract in line with Government regulations. Necessary test certificates in support of the certification shall be submitted prior to supply of the equipment.

It is to be noted that updated and current Standards shall be applicable irrespective of those listed below.

Low voltage Switchgear and Control gear specifications IS 13947 : 1993

Part I – General

Part 2 – Circuit Breakers

Part 3 – Switch Fuse Units

Part 4 – Contactors and Motor Starters

Part 5 – Control Circuit Devices

Electrical Relays for power system protection IS 3231 : 1986

Low voltage Switchgear and Controlgear assemblies IS 8623 : 1993

Marking of Switchgear busbars IS 11353 : 1985

Degree of Protection of Enclosures for low

voltage switchgear IS 2147 : 1962

Code of Practice for selection, installation and

maintenance of Switchgear IS 10118 : 1982

2. SWITCH FUSE UNITS

2.1 Switch fuse units, incorporated in switchboards wherever required shall conform in all respects to IS 13947 : 1993. Switch fuse units shall be suitable for 415 Volts 3 Phase 50 HZ AC supply and shall be suitable for AC - 23 A duty.

Unit housing shall be of robust construction designed to withstand ardous conditions. Sheet steel used shall be given rigorous rust proofing treatment before fabrication and painting Units shall have double break per phase in order to isolate fuse links when the switch is in OFF position.

Operating mechanism of units shall be crisp and positive in action with quick- make and quick-break silver plated contacts. Operating handle shall be suitable for rotary operation unless otherwise specified. Position of handle such as ON and OFF shall be clearly indicated.

All live parts inside the switch fuse units shall be shrouded to prevent any accidental contact.

All the terminals shall be liberally designed. All units above 100 A shall be provided with integral cable sockets.

All switch units shall be provided with suitable interlocks such that the door of the switchboard panel shall not open unless the switch is in OFF position. Provision for padlocking the switch in OFF position shall also be provided.

Routine and type tests as per IS 13947: 1993 shall be conducted at works and test certificates furnished.

3. MOULDED CASE CIRCUIT BREAKERS

i) Moulded case circuit breakers (MCCB) or fuse free breakers, incorporated in switchboards wherever required, shall conform to IS 13947 : 1993 in all respects. MCCBs shall be suitable either for single phase 240 Volts or 3 Phase 415 Volts AC 50 HZ supply.

ii) MCCB cover and case shall be made of high strength heat resisting and flame retard- ant thermosetting insulating material. Operating handle shall be quick make/break, trip - free type. Operating handle shall have suitable ON, OFF and TRIPPED indicators. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases. Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be of thermal/magnetic type provided on each pole and connected by a common tripe bar such that tripping of any one pole causes three poles to open simultaneously. Thermal/magnetic tripping device shall have IDMT characteristics for sustained over loads and short circuits.

iii) Contact trips shall be made of suitable arc resistant sintered alloy. Terminals shall be of liberal design with adequate clearances.

iv) MCCBs shall be provided with following accessories, if specified in drawings/schedule of quantities :

- Under voltage trip

- Shunt trip
- Alarm switch
- Auxiliary switch

v) MCCBs shall be provided with following interlocking devices for interlocking the door a switch board.

- Handle interlock to prevent unnecessary manipulations of the breaker.
- Door interlock to prevent door being opened when the breaker is in ON position
- Deinterlocking device to open the door even if the breaker is in ON position.

MCCBs shall have rupturing capacity as specified in drawings/schedule of quantities.

4. METERING, INSTRUMENTATION AND PROTECTION.

The switchboard shall have required current and potential transformers as per schedule of quantities for metering and protection. The transformers shall comply to relevant ISS and class of accuracy required for metering and protection. Separate sets of CTs shall be provided for metering and protection.

4.1 Current Transformers

C/Ts shall confirm to IS 2705 (part -I, II and III) in all respects. All C/Ts used for medium voltage application shall be rated for 1 kV. C/Ts shall have rated primary current, rated burden and class of accuracy as specified in schedule of quantities/drawings. Rated secondary current shall be 5A unless otherwise stated. Minimum acceptable class for measurement shall be class
0.5 to 1 and for protection class SP 10. C/Ts shall be capable of withstanding magnetic and thermal stresses due to short circuit faults of 31 MVA on medium voltage. Terminals of C/Ts shall be paired permanently for easy identification of poles. C/Ts shall be provided with earthing terminals for earthing chassis, frame work and fixed part of metal casing (if any). Each C/T shall be provided with rating plate indicating:

- Name and make
- Serial number
- Transformation ratio
- Rated burden
- Rated voltage
- Accuracy class

CTs shall be mounded such that they are easily accessible for inspection, maintenance and replacement. Wiring for CT shall be with copper conductor PVC insulated wires with proper termination works and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

4.2 Potential Transformer

PTs shall confirm to IS 3156 (Part-I,II and III) in all respects.

4.3 Measuring Instruments

Direct reading electrical instruments shall conform to IS 1248 or in all respects. Accuracy of direct reading shall be 1.0 of voltmeter and 1.5 for ammeters. Other instruments shall have accuracy of 1.5. Meters shall be suitable for continuous operation between -10° C and +50^{0}C. Meters shall be flush mounting and shall be enclosed in dust tight housing. The housing shall be of steel or phenolic mould. Design and manufacture of meters shall ensure prevention of fogging of instrument glass. Pointer shall be black in colour and shall have Zero position adjustment device operable from outside. Direction of deflection shall be from left to right. Suitable selector switches shall be provided for ammeters and volt meters used in three phase system. The rating type and quantity of meters, instruments and protective device shall be as per Schedule of Quantities /drawings

4.3.1 Ammeters

Ammeters shall be of moving iron type. Moving part assembly shall be with jewel bearings. Jewel bearings shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks. Ammeters shall be manufacture and calibrated as per IS 1248

Ammeters shall normally be suitable for 5 A secondary of current transformers.

Ammeters shall be capable of carrying substantial over loads during fault conditions.

4.3.2 *Voltmeters*

Voltmeters shall be moving iron type range of 3 phase 415 volt voltmeters shall be 0-500.

Volt meters shall be provided with protection fuse.

4.3.3 *Watt meter*

Wattmeter shall be of 3 phase electro dynamic type and shall be provided with a maximum demand indicator if required.

4.3.4 *Power factor meters*

3 phase power factor meters shall be of electro dynamic type with current and potential coils suitable for operation with current and potential transformers provided in the panel. Scale shall be calibrated for 50% lag - 100% - 50% readings. Phase angle accuracy shall be +4^0.

4.3.5 *Energy and reactive power meters*

Trivector meters shall be two element, integrating type, KWH, KVA, KVARH meters. Meters shall confirm to IEC 170 in all respects. Energy meters, KVA, and KVARH meters shall be provided with integrating registers. The registers shall be able to record energy conception of 500 hours corresponding to maximum current at rated voltage and unity power factor. Meters shall be suitable for operation with current and potential transformers available in the panel.

4.4 *Relays*

Protection relays shall be provided with flag type indicators to indicate cause of tripping. Flag indicators shall remain in position till they are reset by hand reset. Relays shall be designed to make or break the normal circuit current with which they are associated. Relay contacts shall be of silver or platinum alloy and shall be designed to withstand repeated

operation without damage. Relays shall be of draw out type to facilitate testing and maintenance. Draw out case shall be dust tight. Relays shall be capable of disconnecting faulty section of network without causing interruption to remaining sections. Analysis of setting shall be made considering relay errors, pickup and overshoot errors and shall be submitted to Engineer-in-Charge for approval.

4.4.1 *Over current relays*

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

4.4.2 *Earth fault relay*

Same as over current relay excepting the current setting shall be 10% to 40% in steps of 10%.

4.4.3 *Under voltage relay*

Under voltage relays shall be of induction type and shall have inverse limit operation characteristics with pickup voltage range of 50 to 90% of the rated voltage.

4.5 *Power factor correction capacitors*

Power factor correction capacitors shall conform to IS 2834 in all respects. Approval of insurance association of India shall be obtain if called for. Capacitors shall be suitable for 3 phase 415 volts 50 HZ supply and shall be available in single and three phase units of 5,10,15,20,25 and 50 kVAR sizes as per requirements. Capacitor shall be usable for indoor use, permissible overloads being as below.

- Voltage overloads shall be 10% for continuous operation and 15% for six hours in a 24 hours cycle.
- Current overloads shall be 15 % for continuous operations and 50% for six hours in a 24 hours cycle.
- Over load of 30% continuously and 45% for six hours in a 24 hours cycle.

Capacitors shall be hermetically sealed in sturdy corrosion proof sheet steel containers and impregnated with non inflammable synthetic liquid. Every element of each capacitory unit shall be provided with its own built in silvered fuse. Capacitors shall have suitable discharge device to reduce the residual voltage from crest value of the rated voltage to 50 volts or less within one minute after capacitor is disconnected from the source of supply. The loss factor of capacitor shall not exceed 0.005 for capacitors with synthetic impregnates The capacitors shall withstand power frequency test voltage of 2500 volts AC for one minute. Insulation resistance between capacitors terminals and containers when a test voltage of 500 volts DC is applied shall not be less than 50 meg.ohms.

5. MEDIUM VOLTAGE SWITCH BOARDS

5.1 GENERAL

- All medium voltage switchboards shall be suitable for operation at three phase/three phase 4 wire, 415 volt, 50 Hz, neutral grounded at transformer system with a short circuit level withstand of 31 MVA at 415 volts or as per schedule of quantities.
- The Switch Boards shall comply with the latest edition with upto date amendments of relevant Indian Standards and Indian Electricity Rules and Regulations.

5.2 SWITCH BOARD CONFIGURATION

- The Switch Board shall be configured with Air Circuit Breakers, MCCB's, and other equipment as called for in the Schedule of Quantities.
- The MCCB's shall be arranged in multi-tier formation whereas the Air Circuit Breakers shall be arranged in Single or Double tier formation only to facilitate operation and maintenance.
- The Switch Boards shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switch gear.

5.3 EQUIPMENT SPECIFICATIONS

All equipment used to configure the Switch Board shall comply to the relevant Standards and Codes of the Bureau of Indian Standards and to the detailed technical Specifications as included in this tender document.

5.4 CONSTRUCTIONAL FEATURES

- The Switch Boards shall be metal enclosed, sheet steel cubicle pattern, extensible, dead front, floor mounting type and suitable for indoor mounting.
- The Switch Boards shall be totally enclosed, 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 protection of IP 42. All doors and covers shall also be fully gasketed with synthetic rubber and shall be lockable.
- The Switch Board shall be fabricated with CRCA Sheet Steel of thickness not less Then 2.0 mm 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.
- All panels and covers shall be properly fitted and square with the frame. The holes in the panel shall be correctly positioned.
- 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.

5.5 SWITCHBOARD DIMENSIONAL LIMITATIONS

- A base channel 75 mm x 5 mm thick shall be provided at the bottom.
- A minimum of 200 mm blank space between the floor of switch board and bottom most unit shall be provided.
- The overall height of the Switch Board shall be limited to 2300 mm
- The height of the operating handle, push buttons etc shall be restricted between 300 mm and 1800 mm from finished floor level.

5.6 SWITCH BOARD COMPARTMENTALIZATION

The Switch Board shall be divided into distinct separate compartments comprising

- A completely enclosed ventilated dust and vermin proof bus bar compartment for the horizontal and vertical busbars.
- Each circuit breaker, and MCCB shall be housed in separate compartments enclosed on all sides.
- Sheet steel hinged lockable doors for each separate compartment shall be provided and duly interlocked with the breaker/switch fuse unit in "on" and "off" position.
- For all Circuit Breakers separate and adequate compartments shall be provided for accom- modating instruments, indicating lamps, control contactors and control fuses etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, busbars and connections.
- A horizontal wire way with screwed cover shall be provided at the top to take interconnecting control wiring between vertical sections.
- Separate cable compartments running the height of the Switch Board in the case of front access Boards shall be provided for incoming and outgoing cables.
- Cable compartments shall be of adequate size for easy termination of all incoming and outgoing cables entering from bottom or top.
- Adequate and proper support shall be provided in cable compartments to support cables.

Following minimum clearances to be maintained after taking into consideration connecting bolts, clamps etc.

i) Between phases 32 mm

ii) Between phases and neutral 26 mm

iii) Between phases and earth 26 mm

vi) Between neutral and earth 26 mm

5.7 SWITCH BOARD BUS BARS

- The Bus Bar and interconnections shall be of electrolytic Copper/Aluminium and of rectangular cross sections suitable for full load current for phase bus bars and half rated current for neutral bus bar. The maximum current density for copper shall be 1.2 amps per sq. mm. and for Aluminium shall be 0.8 amp per Sq. mm. and suitable

to withstand the stresses of a 31 MVA fault level or at 415 volts for 1 second or as per schedule of quantities. .

- The bus bars and interconnections shall be insulated with insulation tape/ fiber glass.
- The bus bars shall be extensible on either side of the Switch Board.
- The bus bars shall be supported on non-breakable, non-hygroscopic insulated supports at regular intervals, to withstand the forces arising from a fault level of 31 MVA at 415 volts for 1 second.
- All bus bars shall be colour coded.
- All bus bar connections in Switch Boards shall be bolted with brass bolts, washers and nuts.

5.8 SWITCH BOARD INTERCONNECTIONS

- All connections between the bus bars/Breakers/ shall be through solid copper strips of adequate size to carry full rated current and PVC/fibre glass insulated.

5.9 DRAW-OUT FEATURES

Air Circuit Breakers shall be provided in fully drawout cubicles. These cubicles shall be such that drawout is possible without disconnection of the wires and cables. The power and control circuits shall have self aligning and self isolating contacts. The fixed and moving contacts shall be easily accessible for operation and maintenance. Mechanical interlocks shall be provided on the drawout cubicles to ensure safety and compliance to relevant Standards. The MCCB's shall be provided in fixed type cubicles.

5.10 INSTRUMENT ACCOMMODATION

- Instruments and indicating lamps shall not be mounted on the Circuit Breaker Compartment door for which a separate and adequate compartment shall be provided and the instrumentation shall be accessible for testing and maintenance without danger of accidental contact with live parts of the Switch Board.
- For MCCB's instruments and indicating lamps can be provided on the compartment doors.
- The current transformers for metering and for protection shall be mounted on the solid copper/ aluminum bus bars with proper supports.

5.11 WIRING

All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labelled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 sq. mm.

5.12 CABLE TERMINATIONS

- The cable terminations of the Circuit Breakers shall be brought out to terminal cable sockets suitably located at the rear of the panel.
- The cable terminations for the MCCB's shall be brought out to the rear in the case of rear access switchboards or in the cable compartment in the case of front access Switch Boards.

- The Switch Boards shall be complete with gland plates

5.13 SPACE HEATERS

The Switch Board shall have in each panel thermostatically controlled space heaters with a controlling 15 amp 230 volt switch socket outlet to eliminate condensation

5.14 EARTHING

A main earth bar of G.I shall be provided throughout the full length of the Switch Board with a provision to make connections to earth stations on both sides.

5.15 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 recognised phosphating process or by using sand blasting method. The steel work shall then receive two costs 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 spray or powder painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall be adequate.

5.16 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.

6. INSTALLATION

The foundations prepared as per the manufacturers drawings shall be levelled, checked for accuracy and the Switch Board installed. All bus bar connections shall be checked with a feeler gauge after installation. The able end boxes shall be sealed to prevent entry of moisture. The main earth bar shall be connected to the sub-station earths.

A 15 mm thick rubber matting of approved make on a 100 mm high timber platform shall be provided in front of and along the full length of the Switch Board. The width of the matting shall be 1000 mm. The rubber mat shall withstand 15 KV for 1 minute and leakage current shall not exceed 160 mA/sq. metre.

After installation the Switch Board shall be tested as required prior to commissioning.

7. OUTDOOR TYPE DISTRIBUTION FEEDER PILLARS

The feeder pillar shall be of the floor mounting type, totally enclosed, and weather proof, conforming to ISI IP 54 incorporating phenolic moulded fuse fittings with high rupturing capacity cartridge fuse links having a certified rupturing capacity of not less than 35 MVA at 433 volts. The feeder pillar shall be suitable for 440 volts 3 phase 4 wires, 50 cycles AC supply.

The cubicle should be fabricated out of heavy gauge sheet steel of thickness not less than2 mm thick with suitable side frame and stiffeners. Hinged doors of not less than 1.6 mm thick should be provided at the front and rear of the cubicle to provide access for

installation, operation, tests and inspection. The rear door is provided to facilitate cable termination and the front door for inspection of fuses, to switch 'ON' and 'OFF' the switch as and when required. All doors should be fitted with dust excluding neoprene gaskets. The doors should also be fitted with suitable locking arrangement with lock to prevent unauthorized opening. The cubicle should be designed for mounting over cement concrete plinths by the roadside, and should be of substantial construction capable of withstanding the vibrations normally experienced due to vehicular traffic. The top of the feeder pillar is of slanting construction in all directions to prevent any collection of water due to rain. A gland plate is provided at the bottom of the feeder pillar (removable) for mounting the cable glands. The feeder pillar shall be fitted on an angle iron pedestal at the bottom covered with sheet metal from all the four sides which facilitates cable bending etc specially with aluminium cables. Two lifting hooks shall be provided at the top. A door switch shall be provided in the feeder pillar so as to switch 'ON' and 'OFF' the lamp fixed in the brass batten holder below the top sheet of the pillar.

The sheet steel materials used in the construction of the cubicle should have undergone a rigorous rust proofing process comprising alkaline degreasing, descaling in dilute sulfuric acid solution and recognized phosphating process. After metal treatment, the interior of the cubicle should be painted with two coats of air-drying red lead primer followed by two coats of air drying anti-condensation paint. The exterior of the cubicle should be painted with two coats of staving red oxide primer followed by one coats of epoxy finishing paint. One final spray of epoxy paint shall be applied at the time of handing over the installation.

All the nuts, bolts shall be cadmium plated with spring washers. A minimum spacing from cable connection to the bottom of gland plate shall be 300mm.

The bus bars should be of electrical grade copper. They should be air insulated with adequate clearances between conductors and between conductors and earth. These should be colour coded to enable immediate identification of the phases and neutral. The current density for bus bars shall not be more than 1.0 amps per square mm. All bus bar joints and tapings should be of the clamped type as far as possible thereby avoiding drilling of holes on bus bars. The bus bars should be carried on supports made out of a suitable non-inflammable and non-hygroscopic material such as Hylam, Permali or Formics. Suitable insulating phase barriers should be provided to prevent accidental short-circuits during operation.

The fuse base contacts should be of copper comprising one top contact for bolting to the bus bar, one bottom contact for terminating the incoming or outgoing cable and a cable lug. The bottom contacts should be so designed that the cable tail from the cable gland to the cable lug is vertical and does not foul with any live parts in its run. The spacing between the respective fuse bases should not be less than 40mm.

The fuse carriers should be fitted as standard to all fuses to minimize accidental contact with live metal during inspection or maintenance. The carriers should be phenolic moulded, designed

to accommodate HRC fuse-links and should incorporate a wedge action device for tightening the fuse-link to the base contact. This wedge action should be operated externally by insulated thumb screws giving uniformly high pressure contact ad ensuring cool running under full load conditions, with positive location of the fuse-link tags on the base contact. The fuse-link shall not work loose due to vibration occurring from vehicular traffic.

A viewing aperture should be provided on the carrier to facilitate location of a 'blown' fuse. The fuse carriers should also be easily withdrawable in service. The design of the carrier should be such that carrier components do not carry any current and the contact is decidedly between fuse-link tag and base contact.

When incoming links are called for it should be possible to fit the carriers with solid links in lieu of fuses.

7.2.1 Specifications for LT Panel/ Switchgear

7.2.1.1 CONSTRUCTION:-

Switchgear enclosure shall conform to the degree of protection IP4x minimum thickness of sheet metal used shall be 2 mm.

The switchgear shall comprise a continuous line up of single / Multi-tire cubicles. The installations of circuit breakers however shall be limited to the bottom two tires only.

The design shall be of fully compartmentalized execution with metal/ insulating portions. Working height shall be limited between 750 mm to 1800 mm from the floor level.

Each breaker shall be housed in a separate cubicle, complete with an individual front access door; each vertical section shall have a removable back cover. All doors & covers shall be gasketed.

Switchgear cubicle shall be so sized as to permit closing of the front access door when the breaker is pulled out to ISOLATED position.

All switchgear, lamps & indicating instruments shall be flush mounted on the respective cubicle door whereas relays & other auxiliary devices of any may be mounted on a separate cubical.

7.2.1.2 BUS AND BUS TAPS

The main buses & connections shall be of high conductivity aluminium alloy, as per IS : 5082 sized for specification current rating with maximum temperature limited to 85 degree C (i.e., 35 degree C rise over 50 degree C ambient). Bus bars shall be designed for a maximum current density of 0.8A/ sq.mm.

All bus connections shall have adequate contact pressure which should be ensure by means of two bolt connections with plain & spring washers locknuts. Bimetallic connections between dissimilar metals.

Bus connections shall be fully insulated for working voltage with adequate phase / ground clearances.

Insulating sleeves for bus bars & surrounds for joints shall be provided.

Bus insulator shall be flame-retardant, track resistant type with high creep age surface.

All buses & connections shall be supported & braced to with stand the stresses due to maximum short circuit current & also to take care of any thermal expansion.

Bus-bars shall be sleeved in colour coded manner for easy identification & so located that the sequence RYB shall be from left to right, top to bottom of front to rear, when

viewed from the front of switchgear assembly.

Bolted disconnected links shall be provided from all incoming & outgoing feeders for isolation of neutral, if necessary.

7.2.1.3 CIRCUIT BREAKER

Circuit breaker shall be three poles, single throw, air breaker type with stored energy, trip free mechanism & shunt trip. The circuit breaker of the outgoing feeder shall have an in built microprocessor base release, short circuit, over current & earth fault protection release.

Circuit breakers shall be draw out type, having SERVICE, TEST & ISOLATED position with positive indication for each position along with in built relay unit.

Circuit breaker of identical rating shall be physically & electrically interchangeable.

Circuit breaker shall be motor wound spring charged mechanism, motor voltage should be 240 V AC. For motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open close-open operation of the circuit breaker shall be possible after failure of power supply to the motor. Power supply for this motor shall be taken from the output of auto changeover.

Mechanical safety interlocking shall be provided to prevent the circuit breaker from being racked in or out of the service position when the breaker is closed.

Automatic safety shutters shall be provided to fully cover the female primary disconnects when the breaker is withdrawn.

Each breaker shall be provided with an emergency manual trip, mechanical ON-OFF indicator, an operation counter & mechanism charge/ discharge indicator.

In additional to the auxiliary contacts required for normal breaker operation & indication, each breaker shall be provided with following for interlocking purpose:-

a) Position/ cell switch with 4 NO. + 4 NC contacts. These shall be available as spare for automation work.

Control Supply:- 230V AC for closing,

Tripping & indication lamps.

a. Auxiliary switch, with 6 NO+ NC contact, mounted on the stationary portion of the switchgear & operated mechanically by a sliding level from the breaker, in SERVICE position. These shall be available as spare for automation work.

Limit / auxiliary switches shall be convertible type, that is, suitable for changing NO contact to NC & Vice-Versa.

7.2.1.4 Moulded Case Circuit Breakers

Moulded case circuit breakers (MCCB) or fuse free breakers, incorporated in switchboards wherever required, shall conform to IS 13947 : 1993 in all respects. MCCBs shall be suitable either for single phase 240 Volts or 3 Phase 415 Volts AC 50 HZ supply.

MCCB cover and case shall be made of high strength heat resisting and flame retardant thermosetting insulating material. Operating handle shall be quick make/break, trip - free type. Operating handle shall have suitable ON, OFF and TRIPPED indicators. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases. Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be of microprocessor based electronic type provided on each pole and connected by a common tripe bar such that tripping of any one pole causes three poles to open simultaneously. Electronic tripping device shall have IDMT characteristics for sustained over loads and short circuits.

Contact trips shall be made of suitable arc resistant sintered alloy. Terminals shall be of liberal design with adequate clearances.

MCCBs shall be provided with following accessories, if specified in drawings/schedule of quantities:

- Shunt trip
- Alarm switch
- Auxiliary switch

MCCBs shall be provided with following interlocking devices for interlocking the door a switch board.

- Handle interlock to prevent unnecessary manipulations of the breaker.
- Door interlock to prevent door being opened when the breaker is in ON position
- De interlocking device to open the door even if the breaker is in ON position.

MCCBs shall have rupturing capacity as specified in drawings/schedule of quantities.

i) MCCB shall be triple pole air break.

ii) The MCCB shall have a quick - make, quick - break mechanism operated by a suitable external rotary handle, complete with position indicator this handle shall have provision for pad locking in ON & OFF position.

iii) MCCB should have microprocessor base electronic release with over current, earth fault & short circuit protection equivalent to L&T 'D' since with RC-10 release.

7.2.1.5 CONTROL & INDICATION :-

The circuit breaker shall be wired up wired up for both local & remote operation. A local- remote selector switch shall be provided for this purpose. Each breaking cubicle shall be equipped with following:-

One (1) Test- neutral - service selector switch stay put type with test/ service position pistol grip handle & key interlock for breaker marked 'E'.

Two (2) heavy duty, oil tight push buttons for TRIP & CLOSE

Three (7) LED indicating lights on front of compartment:- GREEN : Breaker open & spring charged
RED : Breaker close

AMBER : Trip / circuit healthy condition WHITE : Control supply failure

Phase indication : One Red, One Blue & One Yellow

O & 1 NC should be provided for status monitoring of the remote / local position. Lamps shall be low watt, LED type lamp & lens shall be replaceable from the front. The general scheme of connections for control, interlock & protection shall got approved before fabrication of panel.

7.2.1.6 FUSES :-

Fuses shall be HRC, preferably link type with a minimum interrupting capacity equal to the short circuit current.

Fuses shall be furnished complete with fuse base & fittings of such as to permit easy & safe replacement of fuse element. Visible indicated indication shall be provided on blowing of the fuse.

7.2.1.7 CURRENT TRANSFORMER :-

Current transformer shall be cast- resin type. All secondary connections shall be brought out to terminal blocks where or delta connection will be made.

7.2.1.7.1
Ratings :

- for incomers and bus coupler

1500-750/5+5 : 3 sets

- For out goings :

800-400/5+5 : 4 sets

600-300/5+5 : 4 sets

400-200/ 5+5 : 2 sets

7.2.1.7.2 Accuracy class of the current transformers shall be :-

a. Class 5P10 for other relaying (protection).

b. Class 1.0, ISF < 5 for metering.

7.2.1.8 RELAYS :-

Relays shall be of draw out design with built in testing facilities. Small auxiliary relays may be in non-draw out execution.

Relay shall be rated for operation on 5 Amp secondary current & 110 / 220 V secondary voltage; number & rating of relay contacts shall suit the job requirements.

The contractor shall furnish, install & co-ordinate all relays to suit the requirements of protection & interlock & as broadly indicated in the annexure & drawings.

7.2.1.9 METERS (digital display):-

Indicating instruments shall be switch board type & accuracy class of 2%
All Digital Watt-hour meter shall be provided, alternatively, they may have test block to facilitate testing of meter without disturbing C.T. or V.T. secondary connections. Each breaker shall be with volt meter, amp meter with selector switches & KWH meters. Only outgoing feeders will be relaxed from voltmeters.

7.2.1.10 SECONDARY WIRING :-

i. The switchgear shall be fully wired at the factory to ensure proper functioning of control, protection, & interlocking schemes.

ii. Fuses & links shall be provided to permit individual circuit isolation from bus wires without disturbing other circuits. All spare contacts of relays, switches & other devices shall be wired upto terminal blocks.

iii. Wiring shall be done with FRLS PVC flexible, 650V grade, PVC insulated switchboard wires with solid copper conductors of 2.5 sq.mm for voltage circuits along with numbered ferrules.

iv. Each wire shall be identified, at both ends, with permanent markers bearing wire numbers as per contractors wiring diagrams.

v. Wire terminations shall be made with crimping type connectors with insulating sleeves. Wire shall not be spliced between terminals.

11 TERMINAL BLOCKS

i) Terminal blocks shall be 660V grade box clamp type with marking strips, similar to ELMEX 10 sq.mm of equal. Terminals for C.T. secondary leads shall have provision for shorting.

ii) Not more than two wires shall be connected to any terminals equal in number to 20% active terminals shall be furnished.

iii) Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

12 CABLE TERMINATION :-

i) Switchgear shall be designed for cable entry from the bottom. Sufficient space shall be provided for each of termination & connection.

ii) All provision & accessories shall be furnished for termination & connection of cables, including removable gland plates, cable supports, crimp type tinned copper/ aluminum lugs, brass compression gland with tapered washer (power cable only) & terminal block.

iii) Gland plate shall be minimum 4 mm thick.

13 BUS DUCT CONNECTION :-

i) Bus duct connections, where specified shall be furnished along with transportation of panel. Bus duct connections shall be generally from the top.

ii) All connecting bus work shall have the same continuous rating as associated switchgear bus & shall be fully braced for the listed short circuit current.

iii) All provision such as matching flange & other accessories shall be furnished for connection

to bus duct if any, being supplied by this purpose will be furnished by contractor.

14 GROUND BUS :-

i) A ground bus, rated to carry maximum fault current, shall external full length of the switchgear.

ii) The ground bus shall be provided with two bolt drilling with GI bolts & nuts at each to receive 50 x 6mm GI flat.

iii) Each stationary unit shall be connected directly to the ground bus. The frame of each circuit breaker & draw out VT unit shall be grounded through heavy multiple contacts at all times except when the primary disconnecting devices are separated by a safe distance.

iv) Whenever the schematic diagrams indicate a definite ground at the switchgear, a single wire for each circuit thus grounded shall be run independently to the ground bus & connected thereto.

v) C.T. & V.T. secondary neutrals shall be earthed through removable links so removed without disturbing others.

15 NAME PLATES :-

i) Nameplates of approved design shall be furnished at each cubicle & at each instrument & device mounted on or inside the cubicle.

ii) The material shall be lamicoid or approved equal, 3mm thick with white letter on block background.

iii) The name plate shall be held self-tapping screws. Nameplate size shall be minimum 20 x 75 mm for instrument device & 40 x 150mm for panels.

iv) Caution notice suitable metal plate shall be affixed at the back of each vertical panel.

16. SPACE HEATERS PLUG SOCKETS :-

i) Each vertical section shall be provided with thermostat controlled space heater & 5A, 3 pin plug socket.

ii) Cubical heater, plug-socket circuit shall have individual switch fuse units.

17. A.C. / D.C. POWER SUPPLY :-

i) The following power supplied will be made available to the switchgear :

240 A.C. Supply : Two Feeders From these two single-phase feeders a reliable 240V, 1 Ph. AC bus shall be obtained using auto changeover scheme. The necessary equipment's for this scheme should be indicated.

The DC supply required for control purposes is to be obtained in each module through a rectifier arrangement, which will convert the 250V AC supply to 110V DC. The equipment necessary for this rectification including protective relaying as per the approved drawing are also to be included.

ii) Isolating switch fuse units shall be provided at each switchgear for the incoming supplies, 2-pole, single throw for A.C. & 2-pole, double throw for D.C. Bus-wires of adequate capacity

shall be provided to distribute the incoming supplies to different cubicles. Isolating switch-fuse units shall be provided at each cubicle for AC/DC supplies.

iii) AC load shall be so distributed as to present a balance loading on three-phase supply system.

18. PAINTING :-

i) All surfaces shall be sand blasted, pickled & grounded as required to produce a smooth, clean surface free of scale, grease & rust.

ii) After cleaning, the surface shall be given a phosphate coating followed by 2 coats of high quality prime & stove after each coat.

iii) The switchgear shall be finished in light gray (IS shade # 631) with two coats of synthetic enamel paint.

iv) Sufficient quantity of touch- up paint shall be furnished for application at site.

19. SPECIAL TOOLS & TACKLES :-

i) A set of special tools & tackle (manual charging handle & operating handle trolley for lifting outside breaker for maintenance) which are necessary or convenient for erection, commissioning, maintenance & overhauling of the equipment shall be supplied.

ii) The tools shall be shipped in separate containers (Tool Box) clearly marked with the name of the equipment for which they are intended.

1 PARES:-

i) The bidder shall submit list of recommended spare parts for three (3) years satisfactory & trouble free operation indicating the itemized price of each item of the spares.

21. DRAWINGS, DATA & MANUALS :-

i) To be furnished for approval after award of work.

a. General arrangement drawing showing constructional features, space required in front for withdrawals, power & control cable entry points etc.

b. Details of materials with specifications.

c. Typical foundation plan & loading.

d. Typical breaker control schematic.

e. Matching flanges & terminals for the bus termination.

f. Type test reports on circuit breaker.

g. Technical leaflet on

h. Circuit breaker

i. Instrument transformer

j. Relays, meters, switches etc.

k. Single line diagram

l. Control schematic

m. Wiring diagram

22 Instruction manuals of switchgear & individual equipment:-

The manual shall clearly indicate the installation method, checkup & tests to carried out before commissioning of the equipment.

23 The bidder may note that the drawings, data & manuals listed here in are minimum requirements only the bidder shall ensure that the other necessary write-ups, curves & information required to fully describe the equipment are submitted with his bid.

CIRCUIT BREAKER

Make - As per approved make.

Type - Microprocessor release air

- circuit breaker

Rated voltage - 415 Volts

Rated frequency - 50 Hz

Rated current - **1600/(Icu=Icf=1sec 50 kA)**

800A(Icu=Icf=1sec 50 kA)

No. of pole - 3

Aux. Voltage for trip/close coil - 110 V DC

Motor for spring charging Voltage- 240 V AC

Protection unit - Equivalent to SR-18G with fault

indication & thermal masonry.

Interlocking arrangement electrically & mechanically with bus coupler & incomer.

PROTECTION (FOR LT SUPPLY 415V PANEL)

The minimum protections to provided for different type of circuit are listed below:-

INCOMING FEEDER:-

2 over current +E/F relay microprocessor based along with the element of instantaneous o/c & E/F protection.

BUS COUPLER:-

3 O/C relay microprocessor based

All inverse time O/C relay shall be 3 sec. Version.

All definite time O/C relay shall have adjustable time range of 0-6 Sec.

Apart from protection relays each breaker shall be provided with auxi. Contact multiplier relay, anti-pumping relay, trip supervision relay, lockout relay test terminal block. These relay shall be hand reset.

7.2.2 Specifications for LT Bus Duct

7.2.2.1 **Design Criteria**

- The LT non phase segregated bus duct serve as a interconnection between the LT switchgear and outdoor LT transformer.
- The LT bus ducts will be installed partially indoor and partially outdoor in a hot, humid and tropical atmosphere. All panels associated.
- Bus duct associated equipment and wiring shall be provided with tropical finish to prevent fungus growth. All ventilation openings shall be screened and drains shall be filtered to prevent entrance of dust and insects.
- For continuous operation at specified ratings, temperature rise of the bus duct and auxiliary equipment shall be limited to the site permissible values stipulated in relevant standards and / or this specification.
- Bus duct and auxiliary equipment shall be capable of withstanding the mechanical forces and thermal stresses of the short circuit currents listed in the annexure without any damage or deterioration of material.
- The bus ducts shall be self-cooled and shall not be equipped with blower or any other type of forced ventilation.
- Bus duct enclosure shall be of sheet steel.

1. *Specific Requirements.*

- **General**
- The LT bus duct shall be non-phase segregated enclosure type.
- The layout of the bus ducts shall be generally in accordance with enclosed drawings. The details shown however are only typical. Bidder may propose changes to suit his particular design.
- All parts and accessories shall have appropriate match mark and part numbers for easy identification and installation at site.

1. *Enclosure*

- Phase shall be enclosed in weather proof, dust-tight, enclosure of sheet steel fabricated type conforming to degree of protection of IP 55.
- Circumferential neoprene rubber gaskets shall be provided for dust tight joints with adjacent enclosure section.
- The bus enclosure shall have extended bellows or equivalent means to allow for temperature changes and vibrations. Flexible joints shall be provided in enclosures at all points where the bus duct terminates at equipment to withstand vibration, expansion/ construction and at suitable intervals in any straight run of the bus duct where expansion and contraction would otherwise result in stress in the supporting structures.
- All outdoor bus enclosures shall be so designed & constructed as to prevent accumulation of rain water on top sheet. Similarly all gasketted flanged joints shall

be suitably protected against direct splashing of rain water in case of outdoor runs.

- Suitable inspection openings shall be provided for access to support insulators, bus joints, transformer terminals, switchgear terminals etc. All inspection openings shall have reliable sealing arrangement with neoprene gaskets.
- Seal-off bushings complete with wall frame and support plates shall be provided where the bus duct penetrates the building wall. The seal is to prevent free exchange of air between indoor and outdoor portions of the bus duct.
- Silica-gel breather shall be provided on both indoor and outdoor portions of the bus duct.
- Filtered drains for drainage of condensate shall be provided at the lowest points and at such locations where accumulation of condensate can be expected.
- Shipping length of the bus duct shall be not more than three (3) meters in length.

4. Bus Conductor

- The bus conductor shall be of high conductivity, aluminium allow, supported on wet process porcelain insulators.
- The bus conductor shall be designed for bolted connections throughout the run.
- Flexible connections shall be provided between bus sections to allow for expansion and contraction of the conductor. Flexible connections shall also be provide at all equipment terminations.
- All contact surfaces shall be silver plated to ensure an efficient and trouble-free connection. All connection hardware shall be non-magnetic and shall have high corrosion resistance.

5. Disconnect Link

- Removable bolted discount link shall be provided in the bus where shown on the drawing for the purpose of isolation.
- Disconnect link shall consist of a removable section of conductor and shall be so constructed as to permit easy removal or reinsertion without alignment difficulties.
- The bus on both sides of the link shall be rigidly supported so that the disconnect link is equal in mechanical strength to any other section of the bus.
- A minimum clearance of 300mm (12”) shall be provided between the disconnected bus sections with the link removed.

6. Insulators

- Bus support insulators shall be interchangeable, high creep, high strength, wet process, fine glazed porcelain. Alternatively good quality cast resin insulators.
- Insulator shall be mounted in such a way so as to permit easy removal or replacement without disassembly of the bus. The insulator mounting plate shall be designed for cantilever loading to withstand the short circuit.
- The conductor shall be fastened on the insulator through fixed and slip joints so as to allow conductor expansion or contraction without straining the insulator.

- Space heater shall be provided preferably located near to each insulator to avoid moisture condensation within bus-duct. No and wattage rating of space heater shall be decided by the tenderer.

7. Connections & Terminations

- All matching flanges seal off bushings, gaskets, fittings, hardware and supports required for termination of the bus duct at the switchgears, transformers shall be furnished.
- In this connection the contractor is required to coordinate through the Engineer in Charge with the suppliers of the switchgear, transformers with regard to connection details, mechanical and thermal stresses.
- Flexible connections both for conductor and enclosure shall be furnished.
- At all equipment termination to provide for misalignment upto 25mm (1") in all directions.

8. Between bus duct supported from building steel to prevent transmission of vibration.

- The equipment terminal connections shall be readily accessible and shall provide sufficient air gap for safe isolation of equipment during testing.
- If the material of bus conductor and that of the equipment terminal connectors are different then suitable bi-metallic connectors shall be furnished.

9. Grounding

- A separately run 50x6mm GI flat suitably clamped along the enclosure shall be used as the ground bus. All parts of the bus enclosure supporting structures and equipment frames shall be bonded to above ground bus.
- Ground pad shall be bolted type to accommodate 50x6mm galvanized steel flats. Complete with suitable tapped holes, bolts and washers.

10. Supporting Structures

- All supporting structures required for hanging and/or supporting the complete bus duct shall be furnished. These include all members, indoor/outdoor posts, bolts, shims, base plate, beams, hangers, brackets, bracings and hardware.
- All buses shall be adequately supported and braced to successfully withstand normal operation, vibration, thermal expansion, short circuit forces and all specified design loads.
- Supports shall be designed to provide tolerance of plus/minus 12mm (1/2") in the horizontal and vertical directions.
- All steel members shall be hot dip galvanized after fabrication. All hardware shall be of high strength steel with weather resistant finish.
- Concrete foundation, building steel, concrete, inserts/plates will be provided by the owner.
- The contractor shall co-ordinate with the owner for this purpose giving well in advance the details of his requirements so as to enable the owner to arrange for the same in time.

11. Wiring

- All wiring for space heaters shall be done with insulated stranded copper conductor of not less than 2.5 sqmm cross section. Each wire shall be identified at both ends with wire designation as per contractor's wiring diagram and shall be brought out to a terminal box outside the bus duct.
- Terminal blocks shall be box-clamp type Elemex 10 sq.mm with marking strips or approved equal.
- At least 20% spare terminals shall be furnished in the terminal block.

3. *Name Plate*

- **S**uitable name plate shall be furnished with each piece of equipment.
- Materials for name plate shall be plastic/lamicoid, 3mm thick, using white letters on black background.

1. Finish

- Except for supporting steel structures which shall be galvanized, all equipment shall be finished with an undercoat of high quality primer followed by two coats of synthetic enamel paints.
- The interior surface finish shall be as per manufacturer's standard. The shade of exterior surface finish will be battle ship gray shade 632 as per IS-5.
- Pre-treatment consisting of degreasing, derusting etc. shall be done on all fabricated parts before painting or galvanizing.
- Paints shall be carefully selected to withstand heat and weather conditions. The paint shall not scale-off or crinkle or get removed by abrasion due to normal handling.
- Sufficient quantities of all paints and preservatives required for touching up at sites shall be furnished.

4. *Handling of cable drum and cable:*

- Rolling of drum shall be avoided as far practicable. For short distance, the drums may be rolled they are rolled slowly and in proper direction as marked on the drum. In absence of any identification. The drums may be rolled in the same direction as it was rolled during taking up the cable.
- For unreeling the cable, the drum shall be mounted on jacks or on cable well. The spindle shall be strong enough to carry the weight without bending. The drum shall be rolled on the spindle slowly, so that cable should come out over the drum & not below the drum.
- While laying cable, cable shall be used at and interval of 2 meters. The cable shall be pushed over the roller by a gang of people positioned in between rollers. The cable shall not be pulled from the end without laying intermediate pushing arrangement. Bending radius shall no be less than what is specified by manufacturer.

15. *Cable laying:*

- Cables shall generally be installed in cable trays except for some short runs in buried formation or in conduit / pipe for protection or crossing. Multi core power cable laid on

trays & riser shall be neatly dressed & clamped with fabricated 25 x 3 mm G.S flat or cable tray at an interval of maximum 1 meter for vertical / inclined run & 1.50 meter for horizontal run. Control cables may be laid in single layer with touching formation. Power & control cables shall be claimed in separate group. Power & control cables shall be no be laid in a common tray excepting in very special case where a gap of 150 mm shall be maintained between power & control cables.

- H.T & L.T power cables shall be laid in cable trays in single layer & with spacing equal to the diameter of cable.
- Control cable can be laid upto a maximum of three layers in each tray.
- Both power & control cables shall be clamped to the trays rungs by means of clamp made up to 25 x 3 mm fabricated G.S flat at an interval of 1500 mm for horizontal run & 1000 mm for vertical / inclined cable run.
- The cable trays shall be run with a vertical spacing of 300 mm cable trenches. A minimum of 300 mm clearance shall be provided between the top of tray & beams, cold piping, 500 mm clearance for hot piping / object to facilitate installation of cables in tray.
- Adequate pull boxes shall be provided in conduit run to facilitate. Cable pulling in long runs & also to ensure that there will be no more than 270 degree bend between the pull points.
- Cable tray shall be installed to accommodate cable manufacture's recommended maximum pulling tension & minimum bending radius.
- All opening in the floor & wall for cable access shall be sealed after installation of the cable system with non-inflammable materials.
- All floor/ wall for cable entry to the electrical equipment & accessories shall be sealed with non- inflammable material, after completion of cable installation. Thickness of such materials shall be equal to the thickness of floor / wall.

16. *Cable power & control:*

- The tender shall install & connect all power & control cable required for complete installation with in his scope of work. Type and size of power& control cable shall be as specified & as supplied under a separate sub section for power and control cable.
- In general all power and control cable shall be run in cable trays in cable trenches. Isolated runs of control cables shall be run in rigid conduit.
- Jointing of power cable should be avoided as per as possible. However, if any splicing of control cable is required to carry out interlock it will be done junction boxes not in the conduit or in the trays. Such junction boxes shall be in scope of tenderer.
- The contractor shall not installs cables with different voltage in the same cable tray.
- During cable installation care shall be taken so that actually binding radius of each cable is not less than the one recommended by the cable manufacturer.
- For cable buried directly underground their shall be a stone free sand cushion both above and below the cable run being held by brick wall support on two (2) sides. The excavated portion above the top sand cushion shall be covered by concrete precast slab supported on the side walls & finally filled up with standard back fill.

- Cables shall be pulled into the trenches in strict accordance with the cable manufacture's instruction.
- Tender shall furnish & install suitable solder less crimping type cable lugs at the termination of all wires & cables if not already furnished with the equipment.
- All exposed conduits & armoured cables shall be tagged with numbers that appear in the conduit & cable schedules as prepared by the tenderer. All conduits & armoured cable shall be tagged at their entrance and / or exist from any piece of apparatus, junction box or pull box. Aluminum tags shall be used with the number engraved / punched on the tag. Tag shall suitable secured to the conduit or armoured cable.
- The cable tags shall also be provided at all bends and at interval of 30 M on straight run of cable in order to facilitate the identification.
- Laying termination & connection of all control cables for interlock, protection, indication & annunciation.

  The tender shall prepare cable schedule & interconnection diagram & submit the same for approval of the Authority. Cable laying shall be started with the approval cable schedule & interconnection diagrams. Separate cables for each type of following services/ functions as applicable shall be used & laid along the run for each feeders.

a) Power - designate as 'P'

b) Control protection interlock, meeting, indication & annunciation designate as "C".

17. *Filed Testing:*

- Filed testing shall be required for all the equipment & accessories furnished, installed or connected by the tenderer to ensure proper installation, setting, connection & in accordance with the plans, specification and manufacturer's recommendations.
- Testing shall be conducted in presence of Owner's Engineer (i.e., Engineer in Charge) with prior notice at least 2 weeks before commencement of any test.
- Filed testing work shall be done as per the latest edition of the relevant standards. All tests recommended by the equipment manufacturer shall be conducted. The tenderer shall submit the list of all filed tests to be conducted for all equipment & accessories for review / approval by the owner.
- Testing shall include any additional tests suggested by the owner that the deems necessary

because of filed condition to determine that equipment, materials & system meet requirements of the specification.

- The tender shall depute qualified personal to conduit all testing & shall provide all labour and testing equipment required for & incidental to testing.
- The tender shall be responsible for any damage to equipment & material due to improper test procedure or test apparatus & shall replace to original condition of any damaged equipment or material.
- The tender shall maintain in quadruplicate a written record of all tests showing date, personal making the tests, equipment or material tested performed & result. Two copies of test records shall be given to the authority.

18. *Commissioning:*

After the satisfactory test is performed the equipment & material shall be put on trial operation by the tenderer. After successful trial operation, the equipment shall be put on performance tests initially at no load condition & finally with different loading conditions

Figure 2: Modified provisions in CPWD works manual 2019 regarding testing charges to be borne by contractor.

SPECIFICATION FOR THE ELECTRICAL INSTALLATION WORK

The following specifications will apply under all circumstances to the equipment to be installed against this contract and it is to be ensured that the contractor shall obtain for himself at his own expense and on his own responsibility all the information which may be necessary for purpose of making the tender and for entering into a contract keeping in view the specification and inspection of site etc.

The tendered rates shall include for the cost of material erection, connection, commissioning, labour, supervision, tools, transport all taxes, contingencies, breakage, wastage, sundries, scaffolding, maintenance of installations for defect liability period i.e. they should be for an item complete in all respects.

The general specifications of electrical works for internal-2023, general specifications for DG sets-2013 and general specifications for Sub-station works-2013 of CPWD shall be followed.

1. SITE CONDITIONS: the equipment to be erected and commissioned should be suitable for the site conditions, it is estimated that the maximum temperature as site will be 50ºC.

2. L.S.SPECIFICATIONS:

The following Indians standard specifications will apply to the equipment and the contract unless specified otherwise.

a)	Transformer	IS 2026-1977 & 1981
b)	Low tension air-circuit breakers and MCCB	IS 2516-1965
c)	Switch fuse unit on cubicle switch boards etc.	IS 4047-1967
d)	Switch fuse unit on industrial boards etc	IS 4064-1967
e)	Switch gear bus bars	IS 375-1963
f)	HRC fuse links	IS 2208-1962
g)	Distribution fuse boards	IS 2675-1966
h)	Degree of protection provided by enclosure For low voltage switchgear	IS 2147-1962
i)	PVC cables.	IS 1954-1962
j)	11,000 volt paper insulated lead sheathed cables	IS 692-1965

k)	Tubular fluorescent lamps for general lighting Service.	IS 2418-1965
l)	Tungsten filament lamps for general service.	IS 418-1963
m)	Ceiling fans	IS 374-1966
n)	Flood light	IS 1947-1961
o)	Well glass flame proof electric light fitting	IS 2206-1962 Part-I
p)	XLPE cables	IS 7098-Part-II
q)	Industrial light fittings with metal reflectors.	IS 1971-1961
r)	Water tight electric light fittings	IS 3533-1966
s)	Fittings for rigid steel conduits	IS 2667-1964
t)	Rigid steel conduits for electrical wiring	IS 1958-1964
u)	Accessories for rigid steel conduit for electrical Wiring.	IS 3873-1966
v)	Switch socket outlets.	IS 4615-1963
w)	Three pin pug and socket outlets `	IS 1233-1967
x)	Switches for domestic and similar purpose	IS 3858-1966
y)	AC electricity meters	IS 722-1977/1980+86

CODE FOR PRACTICE

Earthing	IS 3043-1966
Electrical wiring installations	IS 732-1963
Lighting protection	IS 2309-1969

7.3 List of Approved Makes for Electrical Works

S.No.	***Items***	***Makes***
1	*MS Conduit (ISI marked)with heavy duty accessories*	*BEC/AKG/ RM CON /Steel Krafts*
2	*PVC/ XLPE insulated aluminium / copper conductor armoured unarmoured MV cables upto*	*Havells / Finolex/ KEI/ Grandlay/ Polycab/Gloster*

	1100 V(ISI Marked)	
3	*FRLS PVC insulated copper conductor stranded flexible wire i/c control cables(ISI Marked)*	*Havells/Finolex/KEI/ Grandlay/Polycab/Gloster*
4	*Cable Raceway floor/wall mounted and accessories*	*Legrand / MK (Honeywell) / OBO/Excel*
5	*Cable Tray & Accessories*	*Venus / MEM / BEC / RM CON/ Indeana/Excel*
6	*Modular Switch & Socket & Accessories*	*Legrand(Myrus)/M.K. (Element) /Schneider (Zencelo) / legrand (Arteor)/ ABB*
7	*Metal clad Industrial Socket outlet and sheet steel Enclosure for MCCB/ MCB*	*Legrand/Siemens/Schneider/Hager*
8	*Cable Glands*	*Dowells/Commet/Gripwell/Raychem*
9	*Lugs and end termination*	*Dowells/Commet/Braco*
10	*Change over switch*	*L&T / Socomac / ABB / Schneider*
11	*Distribution Boards*	*Siemens (Betagard), / Hager / Schneider (Acti9) / Legrand (Ekinox3[3]/ L&T (Exora / ABB (Elegence)*
12	*Protection Device (MCB/RCCB/RCBO/ELCB)*	*Siemens (5SL), Hager / Schneider (Acti9) / Legrand (DX 3) / ABB (S200M) / L&T*
13	*Current transformer / potential transformer*	*AEL / Gilbert & Maxwell / Pragati / Precise / L&T/ Kappa*
14	*Indicating Lamps LED type, Push Button*	*Siemens / L&T / Schneider / Legrand*
15	*Electronic Digital Meters*	*Schnider (conzerv) / L&T / Secure / Siemens / ABB / Legrand*
16	*MCCBs*	*Siemens (3VL) / L&T (D sine) / Schneider (CVS) / Legrand (DPX3) ABB (T max)*
17	*Power Contactor*	*L&T (MNX)/ Schneider (Tesys) / Legrand (CTX[3]) ABB (Ax)*
18	*Surge Protection Devices*	*Siemens/L&T/Schneider / Legrand/ OBO*
19	*Selector Switch*	*Salzer/Seimens /BCH/ Kaycee / L&T*
20	*Auxiliary Relays*	*Siemens/L&T/Schneider/Legrand/ABB*
21	*LED Lighting Fixture*	*Philips/ Wipro/Havells/Crompton*
22	*Emergency Lighting/ Exit Sign boards*	*Bajaj / Prolite / Glo-Line*
23	*Ceiling Fan, Fresh Air Fan, Exhaust Fan*	*Havells/Cromption/ Usha / Orient/ Atomberg*
24	*Paint*	*Nerolac/Asian/Berger/ICI*

25	*Lighting Protech System*	*OBO/ Cape Electric/ Infinite / APS/ Jeff Techno/ Axis*
26	*G.I Pipe*	*Tata, Jindal-Hissar, Prakash Surya*
27	*Rubber Mat (ISI Marked)*	*Jyoti / Deep Jyoti/ Premier*
28	*Fire Extinguisher*	*Minimax/ Life Guard / Cease Fire / Newage*
29	*CU/ GI Strip & GI wire for earthing*	*Jeff Techno/ Axis / OBO*
30	*MS Conduit (ISI marked)*	*BEC/AKG/NIC/ Steel craft/ M-Key, SK (E.R.W)*
31	*PVC Conduit and accessories*	*Polycab/ AKG / Asian*
32	*1.1 KV aluminium armoured XLPE insulated and PVC sheathed cable (LT cable)*	*Havells /KEI/ Finolex/ Grandlay/ Gloster*
33	*Modular Switch & Socket*	*Legrand (Myrus) MK (Element) Schneider (Zencelo India) / Havells/ ABB*
34	*Metal Clad Industrial Socket*	*Legrand / Siemens/Schneider/ C&S/ ABB*
35	*Cat-6 cable*	*Beldon/Siemon/Legrand/Penduit (Pannet)*
36	*Crimp Patch Cord*	*Beldon/Siemon/Legrand/Penuit (Pannet)*
37	*Panel Accessories*	*Siemenss/ L&T/ Schneider / Legrand / Tecnic/ ABB/ C&S/ Neptune*
38	*LED/ Metal Halide / Fluorescent Internal Lighting Fixtures*	*Philips/ Wipro/Havells/Crompton*
39	*External Lighting Fixture*	*Philips/ Wipro/Havells/Crompton*
40	*Ceiling Fan (ISI marked & BEE rated 5 star)*	*Havells / Almonard/ Orient/ Usha/ Bajaj*
41	*Advance lighting protections System (Early Streamer Emission Type)*	*LPI (Australia)-by allied power/ SGI (Duval Messien/ Satellite(France) by SGI/ Bradlay (USA) -by JMV/ Erico (USA) by security shoppe/ ABB*
42	*Main LT Panels/ MCC Panel*	*(Main LT panel / MCC Panel board should be IEC 61439 part-1 and II manufacturer has to produces the relevant test certificate as per IEC code for the same failing which panel shall be rejected). L&T /Siemens / Schneider/ ABB/ Legrand / L&T or their authorized channel partners for IEC 61439 compliant panels*
43	*Air Circuit Breaker*	*Siemens / Schneider/ L&T/ Legrand/ C&S/ ABB*

44	*Surge Voltage Protection*	*Siemens/L&T/Schneider / ABB*
45	*Earth fault module*	*Siemens/Schneider/L&T/Legrand*
46	*Protection relays*	*Siemens/ Areva/ L&T/ Legrand*
47	*C.Ts and PTs*	*Kappa / AE/ Matrix*
48	*Digital Meters*	*Siemens (PAC)/ Schneider/ (conzerv) / Secure Enersol / L&T/ Neptune*
49	*Indicating lamps*	*ESBEE/Schneider/Siemens/Vaishno/Neptune*
50	*Power capacitors*	*Epcos/ Neptune / Legrand /ABB/ L&T*
51	*Automatic Power factor correction relay/controller*	*Epcos/Siemens (PAC) /Schneider (Conzerv)/L&T/Neptune*
52	*Sealed Maintenance Free Batteries*	*Exide/Panasonic/Amara Raja/HBL*
53	*Battery charger*	*Caldyne/Chhabi Electricals/Statcon/Max Power*
54	*Cable Trays (Factory Fabricated/ Overhead & Floor Raceways*	*Legrand/MEM/OBO/ Milestone/ Neptune*
55	*HDPE underground cable duct*	*Rex Polyextrusion/ Tirpura/ Plasomatics/ Duraline*
56	*Insulation Mats*	*DL Miller & Co. Ltd.?Premier Polyfilm Ltd./RMG Polyvinyl India Ltd/Jyoti*
57	*Smoke/Heat detectors*	*Apollo/ System Sensor/ Agni*
58	*Manual Call point*	*PRD/System-Tek/ Simplex/ System Sensor/ Agni*
59	*Response indicators*	*PRD/System-Tek/ Simplex/ System Sensor /Agni*
60	*Fire Exit Signs*	*System-Tek/ Simplex/ Agni*
61	*Fire Control Panel*	*System-Tek/ Morley /Agni*
62	*Speaker / Hooter*	*System-Tek/ Philips /Agni*
63	*Occupancy Sensors/ Movement Sensor*	*Legrand/ Philips/ Wipro*
64	*Flush type switch /socket*	*Anchor/ Kinjal/ SSK/ Havells Reo*
65	*Fuse switches unit / switch fuse unit /HRC fuse*	*L&T / Siemens/ Havells/ C&S*
66	*Exhaust fan*	*Almonard/ Alstom/ Crompton/ Havells*
67	*XLPE insulated HT cables*	*KEI/Havells/Polycab/Gloster/ Grandlay*
68	*Cable lug*	*Ascon (Heavy gauge) Jainson Dowells*
69	*Telephone wires/Telephone Cable / jelly filled telephone cables*	*Finolex /Delton/Havell's*

70	*Telephone tag blocks*	*Krone/ Pouyet*
71	*Telephone outlet*	*MK Electric /Legrand (Mosaic)/Crabtree (Piccadilly)*
72	*GI raceways*	*Milestone Engineering /Legrand/ MDS/ Neptune Systems Pvt. Ltd./MK*
73	*PVC raceways*	*Legrand/ MK*
74	*Electronic ballast*	*Philips / Wipro/ Bajaj/ Decon/Crompton/Havells*
75	*DLP plastic trunking*	*Legrand/MK*
76	*Geysers*	*Recold /Venus /Usha Lexus /Sphere hot*
77	*Tower Light*	*Ligman/Simes/Bega*
78 *79*	*HT/LT transformers* *HT SF-6 circuit breakers / VCB*	*ABB/Schneider /CGL (Crompton Greaves Ltd.)* *Siemens/ ABB/ CGL / Schneider*
80	*Programmable Logic Controller (PLC)*	*Siemens /Allen-Bradley/ Schneider*
81	*Earthing (Chemical Earthing Plate Earthing*	*JMV/ As per CPWD Norms*
82	*Octagonal Pole*	*Bajaj / Crompton / Phillips*
83	*11 kV HT panel Incoming relay*	*CGL/Schneider/ABB/ Siemens*
84	*Control Relay Panel*	*CGL/Schneider/ABB*
85	*Lightning Arrestor*	*ABB/Alltec/JMV*
86	*Temp. Gauge*	*Guru*
87	*Gate Valve*	*Leader/Sant*
88	*Electrical Backup*	*Spare hot/ Racold*
89	*PVC Tank*	*Syntex/ Polycon*
90	*Thermostat*	*ISI Marked*
91	*Flat Collector Plate*	*Solocrome/ Tata BP/ Racold*
92	*S.S Sheet*	*Jindal / National*
93	*HT/LT cable joints (Straight through/outdoor/indoor)*	*3M/ Denson/ M Seal/Raychem/ Cabseal*
94	*Alternator*	*STAMFORD/Crompton Greaves/Kirlosker/Leroy Somer*
95	*DG set engine*	Kirlosker/ Cummins/ Greaves Cotton/Baudouin/Caterpillar/Perkins
96	*DG Set*	*Sterling Generator/ Kirlosker /Caterpillar/Cummins Power / Greaves Cotton/Jackson*
97	*Makes of accessories of HT / LT Panel / Transformers*	*As per standard practice of manufacturer/ Channel partner of L&T /Siemens /*

		Schneider/ ABB/Legrand/Crompton Greaves
98	*Bus Trunking*	*C&S / L&T/ Schneider as per standard practice of OEM manufacturer / channel partner*
99	*HT panel 11 KV*	*ABB/ Schneider/ Siemens /CGL (Crompton Greaves Ltd.)*
100	*Bus Duct*	*Neptune / Milestone/ Tricolite*
101	*Lamp Holder (Brass)*	*Kay/ SSK/ Kinjal*
102	*UPS*	*APC(Schneider)/Vertiv/ABB/Numeric/Delta/ Tmeic*
103	*AMF Panel*	*L&T/ Siemens/ ABB/ Excel Control/ Modern Switchgear*

8 Special Conditions of Contract

8.1 Special Conditions for the minor works under the contract

1. The contract will be used only to execute original works/ minor works/ repair works of urgent nature. It can also be used for any works of restoration as a result of a disaster in campus causing damage to institute infrastructure/ works related to emergency services/ works of institute importance/ works concerned to safety health and environment of campus community. The works undertaken through such contracts are categorized as time bound and should be executed as per Table 6.
2. The contractor should always keep his establishment ready to commence the work immediately after the issue of the work of any amount. The schedule for the issued works under the contract should be at per Table 6. Work requests of urgent nature shall be started at the earliest after receiving orders from the engineer-in-charge but it should be documented with photo and video evidence for all hidden items. Submission of this evidence is mandatory for all works executed.
3. During the execution, the noise creation should be minimized to the extent possible and the works may be carried at odd hours and more than one shift as per requirement.
4. The performance of the instruments or tools to be used should be checked precise before using them on site.
5. The contractor and his/her personnel has to build a well- coordinated system with the users regarding execution of the works.

8.2 Timely Completion

1. All work components must be started simultaneously and has to be delivered together or early within the given time schedule.
2. The contractor has to deploy the labor and supervisory staff in shifts to meet the targeted completion date. The work may be executed in extended shifts or two shifts.
3. Number of days from the date of issue of letter of acceptance for reckoning date of start shall be as per Schedule. *If the Contractor commits default in commencing the execution of the work as aforesaid, the performance guarantee shall be forfeited.*
4. The contractor shall procure the required materials in advance so that there is sufficient time for testing of the materials and approval of the same before use in the work, as required.

8.3 Rates

1. Unless otherwise provided in the schedule of quantities of the work the rates tendered by the contractor shall be all Inclusive and shall apply to all heights, lifts, leads and depths of the building (Inclusive of GST) and nothing extra shall be payable to him on this account.
2. The rates for all items of work shall, unless clearly specified otherwise, include cost of all

labours, materials, testing charges and other inputs involved in the execution of the item irrespective of whether they have been specifically mentioned in the tender document or not.

3. In case the same item (s) appear more than once in the schedule of work / BOQ under the same sub head or among the different subhead of works, the lowest rate quoted for that item (s) shall be considered for the particular item(s) wherever appeared in any part of BOQ / Schedule of works for the purpose of tender evaluation although web generated e-price bid may incorporate different quoted rate for same item(s) as per the quoting pattern of the tenderer. The tendered amount thus worked out shall be final &shall be binding on the contractor.

4. No double scaffolding is payable in single story houses including parapet wall. In multistoried houses the payment of double scaffolding shall be made after 3.5 meter from plinth protected level. The necessary deductions for single scaffolding be made from the items. Contractors are advised to visit the site & quote the rates accordingly.

5. The rates quoted by the contractor will be deemed to be Inclusive of any extra expenditure of this reason. The contractor has to increase the manpower or other tools etc. to do the work as per the quantum of work provided to him at his own expenses. Nothing shall be paid on this account.

6. The contractor shall provide at his own cost suitable weighing, surveying and leveling and measuring arrangements as may be necessary at site for checking. All such equipment shall be got calibrated in advance from laboratory, approved by the Engineer-in-Charge. Nothing extra shall be payable on this account.

7. Other agencies may also simultaneously execute and install the works and the contractor shall afford necessary facilities for the same. The contractor shall leave such recesses, holes, openings, trenches etc. as may be required for such related works (for which inserts, sleeves, brackets, conduits, base plates, clamps etc. shall be available as specified elsewhere in the contract) and the contractor shall fix the same at the time of casting of concrete, stone work and brick work, if required, and nothing extra shall be payable on this account.

8. All material shall only be brought at site as per program finalized with the Engineer-in-Charge. Any pre-delivery of the material not required for immediate consumption shall not be accepted and thus not paid for.

9. MCCB's, switches, sockets, wires, cable, light fixtures, earthing's and other electrical items covered under the contract should conform to approved manufacturers specifications, where CPWD Specifications are not applicable. The contractor should get the materials (fixtures/fittings) tested from approved labs wherever required at his own cost.

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

11. The rates quoted by the Contractor are deemed to be Inclusive of site clearance, setting out work, profile, establishment of reference bench mark(s), taking spot levels, construction of all safety and protection devices, barriers, preparatory works, working during

monsoon, working at all depths, height, lead, lift and location etc until / unless specified otherwise and any other incidental works required to complete this work. Nothing extra shall be payable on this account.

8.4 Quality and Workmanship

1. The contractor shall be entirely responsible and answerable for all the works done by him regarding quality, adherence to the laid down specifications, terms and conditions, warranty/guarantee etc. and he shall be liable to bear any compensation that may be levied by the department under any of the clauses of the agreement.
2. The materials having ISI mark shall have precedence over the one conforming to IS Specifications.
3. The proposed buildings are Institute housing and quality of work is paramount importance. Contractor shall have to engage well experienced skilled labour and deploy modern T&P and other equipment to execute the work.
4. Samples of all materials and fittings to be used in the work in respect of brand manufacturer and quality shall be approved from the Engineer-in-Charge, well in advance of actual execution and shall be preserved till the completion of the work.
5. All materials used in the work shall be new and of good quality, conforming to the relevant specifications as per good engineering practice. All the materials proposed to be used in the work should be approved from Engineer in Charge before use in work.
6. Articles bearing BIS certifications mark shall only be used unless no manufacturer has got BIS/ISI mark for the particular material. Any material/fitting whose sample has not been approved in advance and any other unapproved material brought by the contractor shall be immediately removed as soon as directed. Where the make of any particular material is not specified in the Contract document, the material shall be supplied as per makes desired by the engineer-in-charge.
7. It will be the responsibility of the contractor / bidder to ensure use of genuine materials in the work. The department reserves the right to get (any / all materials / components) inspected by the manufacturer or their authorized representatives at any stage of the execution of work. If any of the materials, supplied and used in work is found spurious at any stage, then the department reserves the right to ask the contractor to replace it by genuine one and make suitable recovery till it is done, even if any payment against that material is already made.
8. The contactor should get the make/TDS documents approved before procuring any material at site. The TDS/Make once approved shall not be changed without any valid recorded reasons. No material to be brought and used at site without the prior knowledge & approval of Engineer-in-Charge.
9. The department may ask for any valid document like manufacturer's test certificate, document for purchase of the material, document for import/shipment of imported materials etc. as deemed fit by the engineer-in- charge to ascertain genuinely of material supplied by/used in the work by the contractor. The contractor shall remain bound to submit all such documents to the department failing which payment may not be made or if

already paid may be recovered/ withheld from subsequent running account payment.

10. All equipment and their components, and all the materials to be used in the work shall be suitable for the environmental conditions at the location of the work.

11. The contractor shall ensure quality control measures on different aspects of construction including materials, workmanship and correct construction methodologies to be adopted. He shall have to submit quality assurance programme within two weeks of the award of work. The quality assurance programme should include method statement for various items of work to be executed along with check lists to enforce quality control.

12. The contractor shall get the source of all other materials, not specified elsewhere in the document, approved from the Engineer-in-Charge. The contractor shall stick to the approved source unless it is absolutely unavoidable. Any change shall be done with the prior approval of the Engineer-in-Charge for which tests etc. shall be done by the contractor at his own cost. Similarly, the contractor shall submit brand/ make of various materials not specified in the agreement, to be used for the approval of the Engineer-in-Charge along with samples and once approved, he shall stick to it.

13. Other Laboratories: The contractor shall arrange carrying out of all tests required under the agreement through the laboratory as approved by the Engineer-in-Charge and shall bear all charges in connection therewith including fee for testing. The said cost of tests shall be borne by the contractor/department in the manner indicated below.

    (a) By the contractor, if the results show that the test does not conform to relevant CPWD Specifications / BIS code or specification mentioned elsewhere in the documents.

    (b) By the department, if the results conform to relevant CPWD Specifications / BIS code or specification mentioned elsewhere in the documents.

    If the tests, which were to be conducted in the site laboratory, are conducted in other laboratories for whatever the reasons, the cost of such tests shall be borne by the contractor.

14. Sample of materials fittings and other articles required for execution of work shall be got approved from the Engineer-in-Charge. Articles manufactured by companies of repute and approved by the Engineer-in-Charge shall only be used. Articles bearing BIS certification mark shall be used in case the above are not available, the quality of samples brought by the contractor shall be judged by standards laid down in the relevant BIS specifications. All materials and articles brought by the contractor to the site for use shall conform to the samples approved by the Engineer-in-Charge which shall be preserved till the completion of the work.

15. The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material/work beyond set out tolerance limit shall be summarily rejected by the Engineer-in-Charge.

16. BIS marked materials except otherwise specified shall be subjected to quality test at the discretion of the Engineer-in-Charge besides testing of other materials as per the specifications described for the item/materials. Wherever BIS marked materials are brought to the site of work, the contractor shall if required, by the Engineer-in-Charge furnish manufacturers test certificate or test certificate from approved testing laboratory to establish that the material produced by the contractor for incorporation in the work

satisfies the provisions of BIS codes relevant to the material and/or the work done.The contractor shall procure all the materials at least in advance so that there is sufficient time to testing and approving of the materials and clearance of the same before use in work.

17. All materials brought by the contractor for use in the work shall be got checked from the Engineer-in-Charge or his authorized representative of the work on receipt of the same at site before use.
18. The contractor shall be fully responsible for the safe custody of the materials issued to him even if the materials are in double lock and key system.

8.5 E&M Works

1. In interpreting the specifications, the following order of decreasing importance shall be followed in case of contradictions:
   (a) Schedule of quantities
   (b) Technical specifications of the NIT
   (c) Approved Drawing (If any)
   (d) CPWD General specification Part – I (Internal) 2014, BIS Codes amended up to date, practices
   (e) CPWD General Specifications for Electrical Works–Part-II(External), 2014 amended up to date.
   (f) Relevant IS or other international code in case IS code is not available.
   (g) Indian Electricity Act 2003 and Indian Electricity Rules 1956 amended up to date.
   (h) Local Fire Regulations applicable at the place of installation. Relevant and applicable foreign standards and specifications amended up to date.
   (i) Any other relevant act or rules and local by-laws.
2. contractor will identify one of the supervisors for taking care of implementation of Safety systems.
3. Smoking is strictly prohibited at workplace.
4. Nobody is allowed to work without wearing safety helmet. Chinstrap of safety helmet shall be always on. Drivers, helpers and operators are no exception.
5. No one is allowed to work at or more than three meters height without wearing safety belt and anchoring the lanyard of safety belt to firm support preferably at shoulder level.
6. No one is allowed to work without adequate foot protection.
7. Usage of eye protection equipment shall be ensured when workmen are engaged for grinding, chipping, welding and gas-cutting. For other jobs as and when site safety co-coordinator insists eye protection has to be provided.
8. All safety appliances like Safety shoes, Safety gloves, Safety helmet, Safety belt, Safety goggles etc. shall be arranged before starting the job. .
9. All excavated pits shall be barricaded & barricading to be maintained till the backfilling is

done. Safe approach to be ensured into every excavation.

10. Adequate illumination at workplace shall be ensured before starting the job at night.
11. All the dangerous moving parts of the portable / fixed machinery being used shall be adequately guarded.
12. Ladders being used at site shall be adequately secured at bottom and top. Ladders shall not be used as work platforms.
13. Material shall not be thrown from the height. If required, the area shall be barricaded and one person shall be posted outside the barricading for preventing the trespassers from entering the area.
14. Other than electricians no one is allowed to carry out electrical connections, repairs on electrical equipment or other jobs related thereto.
15. All electrical connections shall be made using 3 or 5 core cables, having a earth wire.
16. Inserting of bare wires for tapping the power from electrical sockets is completely prohibited.
17. A tools and tackles inspection register must be maintained and updated regularly.
18. Debris, scrap and other materials to be cleared from time to time from the workplace and at the time of closing of work every day.
19. All the unsafe conditions, unsafe acts identified by contractors, reported by site supervisors and / or safety personnel to be corrected on priority basis.
20. No children shall be allowed to enter the workplace.
21. All the lifting tools and tackles shall be stored properly when not in use.
22. Clamps shall be used on Return cables to ensure proper earthling for welding works.
23. Return cables shall be used for earthling.
24. All the pressure gauges used in gas cutting apparatus shall be in good working condition.
25. Proper eye washing facilities shall be made in areas where chemicals are handled.
26. Connectors and hose clamps are used for making welding hose connections.
27. All underground cables for supplying construction power shall be routed using conduit pipes.
28. Spill trays shall be used to contain the oil spills while transferring / storing them.
29. Tapping of power by cutting electric cables in between must be avoided. Proper junction boxes must be used.
30. All the E&M works shall be carried out as per direction and to the satisfaction of the Engineer-in-charge.
31. If the specifications for any item or its component are not available in the CPWD specifications cited above, relevant BIS specification as amended up to date shall be followed, whether or not the specific reference of a particular BIS specification has been made in this specification/ tender document.
32. Wherever any reference to any Indian Standard specification occurs in the document

relating to this contract the same shall be Inclusive of all amendments issued there to or revisions thereof, if any, up to the date of opening of tenders.

33. All materials should conform to relevant BIS specifications wherever the same exists in absence of stipulation in this tender document.

34. Where manufacturers furnish specific instructions / recommendations relating to the materials used in this job and/or their installation, covering points not specifically mentioned in these documents, these instructions shall be followed in all cases and shall be deemed to be included in the schedule of work whether they have been specifically mentioned or not.

35. All chase cuttings in the wall, for recessed conduits & boxes and drilling the holes shall be done with power operated machines only. No chase shall be allowed to be cut manually with the use of hammer & chisel.

36. All cuttings in cement plaster and brick shall be made good by using cement mortar 1:3 (1 part cement, 3-part coarse sand) The cut surfaces shall be repaired by an experienced mason only so as to match the repaired plaster with the original. All such repaired surfaces shall be cured for 3 to 4 days to keep the surfaces wet, using water spray machine (hand/motor operated) and avoid unnecessary flooding of the area.

37. The structural and architectural drawings shall at all times be properly co-related before executing any work.

38. For the purpose of recording measurements and preparing running account bills, the abbreviated nomenclature indicated in the publications Abbreviated Nomenclature of Items of DSR 2022 shall be accepted. The abbreviated nomenclature shall be taken to cover all the materials and operations as per the complete nomenclature of the relevant items in the agreement and relevant specifications. In case of items for which abbreviated nomenclature is not available in the aforesaid publication and also in case of extra and substituted items for which abbreviated nomenclature are not provided for in the agreement, full nomenclature of item shall be reproduced in the measurement books and bill forms for running account bills. For the final bill, however, full nomenclature of all the items shall be adopted in preparing abstract in the electronic measurement books and in the bill forms.

39. The following drawings must be submitted to Executive Engineer within seven days of award of work.

    (a) G.A and schematic drawings of MV switchgear/distribution /conduit layout/wiring drawing, Fire Alarm panel showing material and size of sheet steel/bus bars / inter connections and make and ratings of switchgear i/c details of protection, metering, indicating and inter lock etc

    (b) Conduit layout for lights, fans, socket outlets, telephone outlets, network & fire alarm system and sub mains showing size of conduits, no. of wires and size of wires in each run, location and size of accessories like junction boxes, ceiling boxes for hooks, draw boxes and switch boxed etc.

    (c) Cable routing drawings showing details of size, type and no. of cables and mode of installation.

40. On completion of works and before issuance of completion certificate, the contractor submit completion drawings in the form of three complete set of originals (reproducible).

    (a) As built GA and schematic drawings of MV panels, distributions boards, wiring, cable

laying with sizes, earthling details, fire alarm panels, etc. showing material and size of sheet steel/bus bars/ connections and make and rating of switchgear i/c details of protection, meter indicating and interlocks etc.

(b) Technical literature, test certificates and operation and maintenance manuals required

41. Works Inspection and Testing of Equipment: Prior to dispatch of equipment the Institute reserves the right to inspect the same at the manufacturer's works and the contractor shall provide and secure every reasonable access and facility at the manufacturers works for inspection, for witness of all acceptance and routine tests as per relevant Indian Standards. Contractor shall give a reasonable notice of about 15 days for the purpose of test, and witness of all major equipment's.

42. Pre-commissioning test: All routine tests shall be carried out on the electrical equipment. Protective & measuring devices should be checked for calibration of MCCB's/MCB's, panel & cable meggaring, earthing measurements etc.

HVAC Works

1 Scope of work

1.1 Brief of the works

SITC of VRF type AC system and associated works at Cafeteria, Visitor Hostel, IIT Kanpur.

Note: The scope of the works listed above is indicative only. For the details of the works, please refer to the BoQ and the work has to be done strictly as per the specifications in the BoQ.

1.2 Materials Verification

The contractor shall inform the Engineer in charge in advance, for verifying the measurement of the concealed items like pipes, pipes laying, cable laying etc., done by the contractor on the very day of the above said events.

1.3 Technical Specifications for HVAC Works

PACKAGED TYPE AIR CONDITIONING PLANTS AND VARIBALE REFRI- GERANT FLOW/ VOLUME SYSTEM

1.3.1 Dx-TYPE AIRCOOLED VARIABLE REFRIGERANT FLOW UNIT

Scope: The scope of this section comprises of supply, installation, testing and commissioning of self contained air cooled split type variable refrigerant flow packages each comprising of an outdoor and multiple indoor ductable/non-ductable cassette type units conforming to these specifications and in accordance with the requirement of drawings and schedule of quantities.

Outdoor Unit:

Outdoor unit shall be factory assembled, good for outdoor installation, constructed out of heavy gauge MS panels with weather proof painting. The units shall be factory wired with necessary controls duly tested prior to dispatch conforming to the following specifications.

a. The outdoor unit shall consist of multiple scroll compressors, all with DC inverter drive of variable speed, capable to operate even when one compressor is unserviceable. b. The units shall be provided with duty cycling arrangement for multiple inverter compressors. d. The outdoor unit shall be modular in design to facilitate installation one after another close to each other. Preference would be given to compact units having smaller footprint. e. Outdoor units should be rugged of anti-corrosion design. f. The outdoor unit shall comprise of sub cooling feature to effectively use the entire coil surface through proper circuit/bridge in order to prevent flushing of refrigerant owing to large length of piping. g. The condensing unit shall be provided with state-of-the-art microprocessor based control panel.

The outdoor unit shall be provided with Aero spiral design fan exhibiting low noise level characteristics complete with aero fitting grille to facilitate spiral discharge of airflow to effect reduction in pressure losses. The fan should be capable to respond to external static pressure of 5mm.

The condensing unit shall be designed to facilitate fail safe operation when connected to multiple indoor units.

Following safety devices shall be integral part of the outdoor unit: a. High pressure switch b. Fan drive overload protection switch c. Fusible plug Overload relay including overload protection for inverter driven compressor.

Scroll Compressor:

The scroll compressor shall be an industrial quality rugged, cast iron, direct hermatic compressor with scroll plates, suction & discharge service valves. The compressor shall be complete with straight suction tube, centrifugal oil pump, oil charging valve, oil level sight glass, crank case heater and check valve on the scroll discharge port. The compressor shall be complete with the provision of two-point lubrication for each motor bearing. The compressor shall be completely enclosed in a chamber with no leakage path and providing the capability for scroll plates to separate. The compressor shall be provided with industrial solid motor mounts internal motor protection and vibration isolation pads. Each compressor shall be independently wired and piped to its own circuit for efficient operation & ease of maintenance. The compressor speed shall not exceed 3000 RPM.

The compressor shall be capable of functioning with inverter control. The inverter driven compressor shall preferably be with reluctance DC inverter for higher efficiency and reliability.

Condenser

Condenser shall be air-cooled type, suitable for outdoor installation and shall be suitable for operating at 46 deg C db and 24 deg C wb temperatures. Condenser shall be in copper tube & aluminium fin construction. Condenser coil shall be of minimum 4 rows deep and the fin spacing shall not exceed 2mm. The maximum face velocity across the coil shall not exceed 215 MPM. The condenser frame shall be constructed from heavy duty galvanized steel.

The condenser fan/s shall be of propeller type with 900 RPM variable voltage electric motor complete with IP-55 protection. Motor shall be speed controlled to ensure a stable operation for varying ambient, by a factory fitted direct acting head pressure activated variable speed drive. The condenser shall be complete with provisions for refrigerant piping connections, shut off valves and any other standard accessories necessary with the equipment supplied.

Anti Corrosion Protective Treatment associated with Condensing Units, piping, Joints and U bends & refrigerant piping between outdoor and indoor units.

All interconnecting piping, joints and U bends within the condensing unit shall be painted with two coats of clear transparent polymer coating for protection against corrosion from ambient air pollution.

Two coats of protective coating shall be applied. Each coat shall have dry film thickness of

35 micron or more. The coating shall be strong, flexible and durable. It shall have good adhesive and abrasion resistance. It shall be resistant to moisture, UV, acid, alkali and other chemicals and capable of functioning between -250 C and 1500 C.

The polymer shall be obtained by the mixing of base / monomer with a hardener / polymerizor. It may brush applied or with the use of a suitable gun.

1.3.2 REFRIGERANT PIPING (VRF)

(a) The copper refrigerant piping shall be carried out neatly to connect outdoor and group of indoor units and shall run along with wires/cables. The refrigerant piping shall be carried out using hard drawn copper pipes & ready made copper fittings for pipe diameter exceeding 19mm. Piping less than 19mm shall be carried out using soft seamless copper pipes. Joints shall be affected by soldering/brazing process using silver rods. Suitable sleeves shall be provided at all wall crossings as required. The refrigerant circuit shall include liquid line and gas shut-off valves besides solenoid valve at the end of condenser. The refrigerant piping shall be carefully sized with necessary headers and should consist of accessories including Y-joints.

(b) After the refrigerant piping installation has been completed, the refrigerant piping system shall be pressure tested using nitrogen at pressure of 21Kg/ Sqcm. Pressure shall be maintained in the system for 24 hours. The system shall then be evacuated to minimum vacuum equivalent to 700mm Hg and held for another 24 hours prior to commencement of gas charging.

(c) All refrigerant pipes shall be properly supported and anchored on the cable tray, which in turn be supported to the building structure using steel hangers, anchors, brackets and supports which shall be fixed to the building element by means of inserts or expansion shields of adequate size and number to support the load imposed thereon.

(d) The liquid and suction refrigerant lines including all fittings, valves, strainer etc. shall be insulated with 13 mm thick closed cell elastomeric insulation material preferably in tubing form as specified in Schedule of Quantities.

(e) To protect nitrile rubber insulation associated with exposed copper piping from degrading due to ultra violet rays & atmospheric conditions, it shall be covered with polyshield coating. Fiberglass tape shall be helically wrapped & applied with two coats of resin with hardener to give smooth finish.

(f) The recommended wall thickness of copper pipes being used for VRF application using high pressure refrigerant, R 410 a, is as under:

(g) The VRF indoor unit will be cassette (ceiling type) & split hi wall mounted type of nominal capacity as mentioned in the BOQ.

(h) Machine will be operable on 380 415 volts, 3 phase, 50 Hz power supply with double earthing through proper isolator/MCB in each outdoor unit & 220+6% volt, 1 phase, 50 Hz stabilized power supply with double earthing in each VRF indoor units through proper switch.

(i) The quantities of each item mentioned in schedule of quantities shall be on the measureable basis, any upward/downward variation shall be derived at the basis of unit rate of the

corresponding item.

Copper Pipe Outer dia (mm)	Copper tube wall thickness (mm) (Min. requirement)
Dia 6.4	0.8
Dia 9.5	0.8
Dia 12.7	0.8
Dia 15.9	1
Dia 19.1	0.8
Dia 22.2	0.8
Dia 25.4	0.88
Dia 28.6	0.99
Dia 31.8	1.10
Dia 34.9	1.21
Dia 38.1	1.32
Dia 41.3	1.43

1.3.3 DUCT WORK AND OUTLETS

(j) General:

The work under this part shall consist of furnishing labour materials, equipment and appliances as specified necessary and required to install all sheet metal and other allied work to make the air conditioning supply, ventilating, and exhaust system ready for operation as per drawings.

Except as otherwise specified all duct work and related items shall be in accordance with these specifications.

Duct work shall mean all ducts, casings, dampers, access doors, joints, stiffners and hangers.

(k) Duct Materials:

The ducts shall be fabricated from galvanized steel sheets class VIII conforming to ISS:277-1962 (revised) or aluminium sheets conforming to ISS:737-1955 (wherever aluminium ducts are specified).

All duct work, sheet metal thickness and fabrication unless otherwise directed, shall strictly meet requirements, as described in IS:655-1963 with amendment-I (1971 edition)

The thickness of the sheet shall be as follows :-

The gauges, joints and bracings for sheet metal duct work shall further conform to the provisions as shown on the drawings.

Ducts larger than 600 MM shall be cross broken, duct sections upto 1200 MM length may

be used with bracing angles omitted.

Changes in section of duct work shall be affected by tapering the ducts with as long a taper as possible. All branches shall be taken off at not more than 45 DEG. Angle from the axis of the main duct unless otherwise approved by the Engineer-In-Charge.

Size of Duct	Sheet Thickness		Type of Joints	Bracing if any
Upto 750 mm	0.63 mm	24 Ga	G.I. Flange	
751 mm to 1000 mm	0.80 mm	22 Ga	25x25x3 mm Angle iron frame with 8 mm dia nuts & bolts	25x25x3 mm at the rate of 1.2 M from joints
1001 mm to 1500 mm	0.80 mm	22 Ga	40x40x5 mm Angle iron frame with 8 mm dia nuts & bolts	40x40x5 mm at the rate of 1.2 M from joints
1501 mm to 2250 mm	1.00 mm	20 Ga.	50x50x5 mm Angle iron frame with 10 mm dia nuts & bolts at 125 mm centre.	40x40x3 mm at the rate of 1.2 M to be Braced Diagonally
2251 mm and above	1.25 mm	18 Ga.	50x50x6 mm Angle iron frame with 10 mm dia nuts & bolts at 125 mm centre.	40x40x3 mm at the rate of 1.6 M from joints

All ducts shall be supported from the ceiling/slab by means of M.S. Rods of 9 MM (3/8")DIA with M.S. Angle at the bottom. The rods shall be anchored to R.C. Slab using metallic expansion fasteners.

(l) Installations During the construction, the contractor shall temporarily close duct openings with sheet metal covers to prevent debris entering ducts and to maintain opening straight and square, as per direction of Engineer-In-Charge.

- Great care should be taken to ensure that the duct work does not extend outside and beyond height limits as noted on the drawings.
- All duct work shall be of high quality approved galvanized sheet steel guaranteed not to crack or peel on bending or fabrication of ducts. All joints shall be air tight and shall be made in the direction of air flow.

  The ducts shall be re-inforced with structured members where necessary, and must be secured in place so as to avoid vibration of the duct on its support.

- All air turns of 45 degrees or more shall include curved metal blades or vanes arranged so as to permit the air to make the abrupt turns without an appreciable turbulence. Turning vanes shall be securely fastened to prevent noise or vibration.
- The duct work shall be varied in shape and position to fit actual conditions at building site. All changes shall be subjected to the approval of the Engineer-In-Charge. The contractor shall verify all measurements at site and shall notify the Engineer-In-Charge of any difficulty in carrying out his work before fabrication.
- Sponge rubber or approved equal gaskets of 6 MM maximum thickness shall be self adhesive installed between duct flanges as well as between all connections of sheet metal ducts to walls, floor columns, heater casings and filter casings. Sheet metal connections shall be made to walls and floors by means of wooden member anchored to the building structure with anchor bolts and with the sheet screwed to them.
- Flanges bracings and supports are to be black, mild steel and are to be painted with rust proof primer on all surfaces before erection. Accessories such as damper blades and access panels are to be of materials of appropriate thickness and the finish similar to the adjacent ducting, as specified.
- Joints, seams, sleeves, splitters, branches, takeoffs and supports are to be as per duct details as specified, or as decided by Engineer-In-Charge.
- Joints requiring bolting or rivetting may be fixed by Hexagon nuts and bolts, stove bolts or buck bolts, rivets or closed centre top rivets or spot welding. Self tapping screws must not be used. All jointing material must have a finish such as cadmium plating or Galvanized as appropriate.
- Fire retarding flexible joints are to be fitted to the suction and delivery of all fans. The material is to be normally double heavy canvass or as directed by Engineer-In-Charge. On all circular spigots the flexible materials are to be screwed or clip band with adjustable screws or toggle fitting. For rectangular ducts the material is to be flanged and bolted with a backing flat or bolted to mating flange with backing flat.
- The flexible joints are to be not less than 75 MM and not more than 250 MM between faces.
- The duct work should be carried out in a manner and at such time as not to hinder or delay the work of the other agencies especially the boxing or false ceiling contractors.
- Duct passing through brick or masonry, wooden frame work shall be provided within the opening. Crossing duct shall have heavy flanges, collars on each side of wooden frame to make the duct leak proof.

(m) Dampers

- At the junction of each branch duct with main duct and split of main duct, volume dampers must be provided. Dampers shall be two gauges heavier than the gauge of the large duct and shall be rigid in construction.
- The volume dampers shall be of an approved type, lever operated and completed with locking devices which will permit the dampers to be adjusted and locked in any positions and clearly indicating the damper position.

- The dampers shall be of splitter, butterfly or louver type. The damper blade shall not be less than 1.25 MM (18) Gauge, reinforced with 25 MM angles 3 MM thick along any unsupported side longer than 250 MM. Angles shall not interfere with the operation of dampers, nor cause any turbulence.
- Automatic and manual volume opposed blade dampers shall be completed with frames and bronze bearings as per drawings. Dampers and frames shall be constructed of 1.6 MM steel sheets and blades shall not be over 225 MM wide. The dampers for fresh air inlet shall additionally be provided with fly mesh screen, on the outside, of 0.8 MM thickness with fine mesh.
- Wherever require for system balancing, a volume balancing opposed blade damper with quadrant and thumb screw lock shall be provided.
- After completion of the duct work, dampers are to be adjusted and set to deliver air flow as specified on the drawings.

(n) Fire Dampers

- Automatic fire dampers shall be provided wherever shown on the drawings. The damper shall be multi blade louvre type. The blades should remain in the air stream in open position and shall be constructed with minimum 1.8 MM thick galvanised sheets. The frame shall be of 1.6 MM thickness. Other materials shall include locking device, motorised actuator, control panel to trip AHU motor etc.
- The fire dampers shall be capable of operating automatically on receiving signal from a fire alarm panel. All control wiring shall be provided between fire damper and electric panel.

(o) Access panel

A hinged and gasketed access panel measuring at least 450 MM x 450 MM shall be provided on duct work before each reheat coil and at each control device that may be located inside the duct work.

(p) Miscellaneous

- All duct work joints are to be true right angle and with all sharp edges removed.
- Sponge rubber gaskets also to be provided behind the flange of all grilles.
- Each chute from the duct, leading to a grille, shall be provided with an air deflector to divert the air into the grille through the shoot.
- Diverting vanes must be provided at the bends exceeding 600 MM and at branches connected into the main duct without a neck.
- Proper hangers and supports should be provided to hold the duct rigidly, to keep them straight and to avoid vibrations. Additional supports are to be provided where required for rigidity or as directed by Engineer-In-Charge.
- The ducts should be routed directly with a minimum of directional change.
- The duct work shall be provided with additional supports/hangers, wherever required or as directed by the Engineer-In-Charge, at no extra cost.
- All angle iron flanges to be welded electrically and holes to be drilled.

- All the angle iron flanges to be connected to the GSS ducts by rivets at 100 MM centres.
- All the flanged joints, to have a sponge rubber packing stuck to the flanges with suitable adhesive.
- The G.S.S. ducts should be lapped 6 MM across the flanges.
- The ducts should be supported by approved type supports at a distance not exceeding 2.0 Metres.

(q) Standard Grilles

The supply and return air grilles shall be fabricated from extruded aluminium sections. The supply air grilles shall have single/double louvers. The front horizontal louvers shall be of extruded section, fixed/adjustable type. The rear vertical louvers where required shall of aluminum extruded sections and adjustable type. The return air grille shall have single horizontal extruded section fixed louvers. The grilles may or may not be with an outer frame.

The damper blades shall also be of extruded aluminium sections. The grill flange shall be fabricated out of aluminium extruded section. Grilles longer than 450 MM shall have intermediate supports for the horizontal louvers.

(r) Diffusers

- The ceiling type square diffusers shall be of aluminum extruded sections with flush or step down face, as specified with fixed pattern and neck.
- All supply diffusers shall be provided with extruded aluminium dampers, with arrangement for adjustment from the bottom.
- The slot diffusers shall be of aluminium extruded sections with diffusion plate and sliding damper.

(s) Linear Diffusers/Grilles

- The linear diffusers/grilles shall be fabricated from Aluminium extruded sections.
- The diffusion blades shall be extruded, flush mounted type with single or double direction air flow.
- The frame shall be of aluminum extruded section and shall hold the louvers tightly in fixed position.
- The dampers as described under grilles shall be provided wherever specified.

(t) Exhaust Grilles

The exhaust grilles shall be fabricated from aluminum extruded sections.

The exhaust grilles shall be horizontal fixed bar grilles with 150 blade inclination.

(u) Sensor Terminal

Sensor mounting terminal with cap shall be provided for taking temperature, pressure or other measurement in ducts or AHUs.

The terminal shall be fabricated from gun metal stock, duly threaded with check nut, nut and washers.

(v) Painting and Vision Barrier

All grilles, and diffusers shall be powder coated, before installation, in approved colour.

All ducts immediately behind the grilles/diffusers etc. are to be given two coats of black paint in matt finish.

The return air and dummy portion of all linear grilles shall be provided with a vision barrier made of 24 gauge galvanised sheets. The vision barrier shall be fixed to the false ceiling frame with self tapping screws and shall be given two coats of black paint in matt finish. Care shall be taken to ensure that the return air path is not obstructed.

(w) Testing

After completion, all duct system shall be tested for air leakage.

The entire air distribution system shall be balanced to supply the air quantity as required in various areas and the final tabulation of air quantity through each outlet shall be submitted to the Engineer-In-Charge for approval.

1.3.4 INSULATION

- General

The Insulation of water piping, air handling units, ducting, chillers & refrigerant piping etc., shall be carried out as per specifications given below:

- Materials

The materials to be used for insulation shall be as follows, unless some other material is specifically mentioned elsewhere. The detailed specifications of the materials are listed under respective sub heads.

Pipe Insulation : Rigid Polyurethane Foam (PUF) Drain Pipe Insulation : Polyethylene Foam (Kinney Foam) Duct Insulation : Resin Bonded glass wool Acoustic Treatment : Resin Bonded glass wool Equipment Insulation : Expanded Polystyrene (SE) (EP). Refrigerant Pipe : Nitrile rubber insulation

- Duct Insulation

The materials for duct insulation shall be resin bonded fibre glass, as described earlier but conforming to I.S. 8183 of 1976. The density of insulation shall not be less than 24 kg/cubm and material shall be in the form of blankets/rolls of uniform thickness. The 'K' value at 10o C. Shall not be less than 0.031 W/mK. It shall be factory faced with aluminium foil on one side reinforced with kraft paper and fused to the insulation material. The thickness of duct insulation shall be as follows : a. Duct in conditioned space - 25 mm thick b. Duct in unconditioned space - 50 mm thick

- Acoustic Treatment

The material for acoustic treatment of ducts, rooms, roofs etc. shall be resin bonded fibre

glass, as described earlier, conforming to I.S. 8183 of 1976. The density of fibre glass shall be 32 kg/cub.m and the material shall be in the form of boards of uniform density. The 'k' value at 10oC shall not be less than 0.03 W/mK. Facing shall be provided with 0.5 mm perforated aluminium sheet held with G.I. Nuts bolts or nailed to the batten work as required. The thickness of insulation shall be as follow unless otherwise specified elsewhere: a. Duct Acoustic : 25 MM b. Room Acoustic : 50 MM

- Installation

  Drain Piping

  The pipe shall be thoroughly cleaned with a wire brush and rendered free from all rust and grease. Coat the pipe with one layer of red oxide primer. Then two layer of 6mm thick insulation shall be wrapped on the pipe. Then it shall be tied with 1 mm thick G.I. wires.

  Ducting

  Clean the surface with a wire brush and make it free from rust and oil. Apply two coats of CPRX compound on the cleaned surface. Wrap the duct with insulation blankets of the thickness mentioned in item 3.3.2 above and covered with 0.63 mm/19 mm wire mesh netting on the outside. The joints shall be sealed with aluminium tape before covering with wire netting. The Ducts in areas exposed to the weather shall be additionally covered with one layer of tar felt B.H. The tar felt shall be stuck with Hot Bitumen.

  Duct Acoustic Lining

  The duct surface shall first be cleaned from inside. Then 25 mm square section made of 18 Ga (1.2 mm) thick G.I. sheet should be fixed on both ends of the duct piece. The insulation slabs should be fixed between these sections of ducts using adhesive compound and stick pins. The insulation shall the be covered with RP tissue, sealing all joint so that no fibre is visible. The insulation shall then be covered with 0.5 mm perforated aluminium sheets. The sheet of insulation shall be secured to the duct by means of stick pins as mentioned above.

  Equipment

  The surface shall first be cleaned with wire brush. Then two layers of hot bitumen shall be applied. The insulation shall then be fixed in one layer and sealing them with hot bitumen. The insulation shall then be covered with 0.63 mm/ 19 mm mesh wire netting which shall be fixed to the insulation with brass 'U' nails. The final finish shall be 0.50 mm aluminium cladding.

  Room Acoustic

  Fix 40 mm x 50 mm G.I. channels at 0.5 metre interval longitudinally then fix cross battens at 1.0 metre centre using suitable gutties, and brass screws. Fill each rectangle with 50 mm glass wool and covered with RP tissue. Tie with 24 gauge G.I. Wires at 300 mm intervals. Then cover with 22 gauge (0.80 mm) perforated Aluminium sheet having 3 mm perforations at 6 mm centres. Overlap all joints and provide beading of 25 mm by 2 mm flats. All corners joints shall be covered with 25 x 25 x 2 mm thick aluminium angles.

1.3.5 ELECTRIC CABLING

- General:

  The electric cable connections of motors and earthing of all equipments shall be carried out, as per specifications, given hereunder.

- Cabling

The cabling of various equipment shall be carried using PVC Insulated and armoured cables.

The PVC armoured power cable for use on 415 volts system shall be 3 or 3.5 Core with aluminium conductors and be of 660/1100 volts grade, as per IS 1554 (Part I) 1964. The cross section of the cable shall be to suit the load and rating of the equipment. The cables shall be of aluminium conductor, PVC insulated, strip armoured with overall PVC sheathing.

The cables shall be laid as per IS-1255/1967, Indian standard code of practice. The cables shall be laid, as per drawings in the ducts/pipes/trays etc. along a short and convenient route between switch board and the equipment, (either in trenches, on wall or on hangers, supported from the slab). Cable routing shall be checked at the site of work to avoid interference with structure, equipment etc. Where more than one cables are running close to each other, proper spacing should be provided between them. The radius of bends of the cable should not be less than 12 times the overall dia. of cable in order to prevent undue stress and damage at the bends, the cables should be supported with wooden cleats on M.S. Supports, when laid in trenches, or wall/ceiling suspended hangers. When laid underground the cables should be covered with fine soft earth and protected with 2nd Class bricks. Suitable G.I. Pipe shall be used wherever cables are laid under the roads etc. Wooden bushes shall be provided at the ends of pipes through which cables are connected through.

- Surface Wiring

The surface wiring shall be cassed in conduits which shall be of 1100 volts grade and conform to IS 9587-1987 (revised to date) The conduits used shall be of high quality & all joints shall be made with sockets. The bends and elbows shall have inspection covers fixed with grease free screws. The joints shall be water tight. Approved metal saddles shall be used to secure the exposed conduits at a space of 1 meter or less. The connection of the conduits to switches etc., shall be secured by check nuts and ebonite bushes provided at the ends of conduits. The M.S. conduits shall be heavy duty and rigid type-ISI marked/conforming to IS specifications. The wall thickness shall not be less than 2 mm. For conduits above 32 mm dia. Metallic conduits of 19 mm dia. and below shall not be used. Conduit accessories (Boxes etc.) shall conform to IS-5133-1968 and IS-2667-64 (amended-revised to date). Conduit pipes shall be jointed, wherever necessary by means of screwed couples and screwed accessories only. In Long distance straight, run of conduits inspection type couplers at suitable intervals shall be provided. Threads on conduit pipes shall be between 13 mm to 19 mm long. The wiring shall be carried-out as per IS 732-1989 (Amended and revised to date).

Flush inspection covers shall be provided in case of Concealed, recessed conduits. The staples for the conduits shall not be spaced more than 0.60 meters apart. Before filling up the chase with concrete the conduits should be given a coat of rust proof paint.

The wires shall be drawn only after all the conduits have been properly fixed in position. Fish wires (steel wire : 16 SWG) shall be laid in conduits for drawing of wires subsequently.

- Control Cabling/wiring

  Control cables shall be1100 volts grade, as per IS 1554, made from copper conductor of 1.5 Sq mm PVC insulated single Core, strip armoured with an overall PVC sheathing.

  The cables and conduits wiring shall be carried out as per details given under 2.2 and 2.3 above.

- Earthing : All equipment connected with electric supply shall also be provided with double earthing continuity conductors. The size of G.I. earthing conductors shall be :-

Size of phase wire sq.mm Aluminium	Size of G.I. conductor Tape/Wire (Swg)
185	25 mm x 6 mm (strip)
150	25 mm x 6 mm (strip)
120	25 mm x 6 mm (strip)
95	4 Swg
70	4 Swg
50	6 Swg
35	6 Swg
25-6	6 Swg
4	6 Swg

Note : Aluminium earthing conductors of equivalent Size may be used in lieu of GSS conductors mentioned above.

- Miscellaneous

  The final connections to the equipment shall be through Flexible connections in case of conduit wiring and also where the equipment is likely to be moved back and forth, such as on slide rails.

An isolator switch shall be provided at any motor which is separated from the main switch panel by a wall or partition or other barrier or is more than 15 metres away from the main panel.

Two separate and distinct earthing conductors shall be Connected from the equipment

upto the main switch board panel.

The branch lines from the main panel to each equipment shall be separated and should not criss cross other lines.

The entire installation shall be tested as per Electricity rules and I.S.S. 732-1973 with amendments 1,2&3 prior to the commissioning of the plant and a suitable test report furnished by a competent and authorized person. The test report will be obtain by contractor himself at his own expenses.

All exposed switch board panels, conduits, hangers etc. shall be given 2 coats of suitable paint of approved colour, when all work has been completed.

1.3.6 TESTING AND COMMISSIONING

- General

  The contractor must perform all inspection and tests of the system as a whole and of components individually as required, under the supervision of the architect, in accordance with the provisions of the applicable ASHRAE standards or approved equal in addition to furnish necessary test certificates from manufacturers.

  The system shall then be commissioned, tested and balanced to fulfil the intent and purpose for which it is designed.

  In addition continuous Run Tests shall be carried out during peak weather condition.

- Compressors Condensers/Chillers/Evaporators/Pumps etc.

  Hydraulic test for various components and assembled equipments at 1.5 times design pressure or double the operating pressure, whichever is higher.

  Pneumatic leak test after assemblies at design pressure

  Static and dynamic balancing on electronic precision machine for rotating parts, links, impellor/ crank shaft assemblies etc.

  Testing of oil passages in compressor at 1.5 times pump

  discharge pressure. Pressure drop test for condenser, chiller

  and evaporator.

  For compressor assembly, electronic leak, air running test, pneumatic test with dry nitrogen and leak test in water.

- Air Handling Units

  Blowers Dynamic/static balancing of impellers. Performance test as per applicable codes.

  Coils Pneumatic test.

  Filters Test of filter elements as per B.S. 2831 B.S. 1701 as applicable. This is to ascertain filtration efficiency by weight at inlet and outlet. Manufacturer's test certificates also to be produced for the assembled A.H.U. Final dimensional check will be done. Inspection may be done during assembly of components for quality of workmanship, painting etc.

  - Piping Materials check for specifications and size.
  - Valves Hydraulic./pneumatic test certificates.
  - Motors Manufacturer's test certificate as per motor data sheet.
  - Instruments and Controls Visual examination.
  - Special Note Vendor to note that above procedure is to be followed in addition to the specifications attached

with the tender.

- Associated Works at Site.

  All electrical items will be subjected to inspection at any stage during manufacturing activity. Routine electrical test as per relevant codes. Inspection of manufacturer's test certificates.

  - Inspection of raw materials to be used for fabrication and assembly and inspection of manufacturer's certificates.
  - Inspection of welding including welders qualification as desired by inspection engineers. Inspection of fabricated items.
  - Pressure testing of pipe fittings used for the refrigerant and water and other services.

- Pressure testing, leak testing of complete piping network for chilled water. (Condenser water and refrigerant/services).
  - Checking of electrical circuits (power & controls) and checking functioning of controls of refrigerant systems and other circuits of air conditioning plant.
  - Checking of calibration of controls and instrumentation
  - Checking of assemblies or electrical control panel, instruments panels, local panels (dimensional and functional) annunciator panels etc.
  - Inspection of complete electrical installation at site.
  - Performance testing of complete A.C. Plant as per specifications.

- Vendor Responsibility

  The above inspection procedure is given for general guidance and information of vendors. The inspection of purchaser/consultant is strictly not limited to these.

  The inspection engineer of purchaser/consultant will have full right, to have detailed inspection at any stage right from placement of order to completion of project, as and when desired by inspection engineer.

  Co-ordination of inspection agency of purchaser/consultant with his factory/subvendor's factory/erection site will be the sole responsibility of successful vendor, subsequent to placement of order for complete air conditioning plant, covered under these technical specifications.

- Piping System

  In general pressure tests shall be applied to piping only before connection of equipment and appliances. In no case shall piping, equipment or appliances be subjected to pressure exceeding their test ratings.

  Tests shall be completed and approved before any insulation is applied.

After tests have been completed, the system shall be drained and cleaned of all dust and foreign matter. All strainers, valves and fittings shall be cleaned of all dirt, fittings, and debris.

Water Piping

All water piping shall be tested and proven tight under Hydrostatic pressure of 11 Kg/Cm (150 PSI) or 1.5 times the design pressure which ever is more unless stated otherwise in the specifications. The prescribed pressure shall be maintained for eight hours. In case leaks are detected, the pressure test will be repeated, after the repair of the leaks.

- Duct Work

  All branches and outlets shall be tested for air quantity, and the total of the air quantities shall be within plus five percent (5%) of fan capacity.

  Fire dampers, volume dampers and splitter dampers shall be tested for proper operation.

- Electrical Equipment

- All electrical equipment shall be cleaned and adjusted on site before application of power.

- The following tests shall

  be carried out: Cables

  and Wires continuity

  tests.

  Insulation resistance tests, phase to phase and phase to earth, on all circuits and equipment, using a 500 Volts meggar. The meggar reading shall be not less than one megaohm.

  Earth resistance between conduit system and earth must not exceed

  half (1/2) CMH. Phasing out and phase rotation tests.

  Operating tests on all protective relays to prove their correct operation before ener- gising the main equipment.

  Operating tests on all starters, circuit breakers etc.

- Plant Audit & Certification work

  - The work of plant audit & certification shall be done by an approved outside agency.

  - The whole system balancing shall be tested with microprocessor based Hi-tech instru- ments with an accuracy of + 0.5

- The instrument shall be capable of storing data and then down loading into a PC. The agency shall provide a minimum but not limited to the following instruments.

  Microprocessor based velocity calculation meter to measure DB and

WB temperature, RH and dew point.

Velocicalc meter to measure air volume and air velocity. Pitot tube. Electronic Rotary Vane Anemometer. Accubalance Flow Measuring Hood.

- The outside agency shall analyse all the data and shall be responsible for the capacity and performance audit and certification of the plant.
- The successful Bidder shall be responsible to provide necessary sockets and connections for fixing of the Testing Instruments, probes etc.

- Commissioning of the System
  - The system shall be commissioned by adopting the following procedure.
  - The installation as a whole shall be balanced and tested upon completion, and all relevant information, including the following shall be submitted to the architects.

    Air volume passing through each unit, duct,

    grilles, aperatures. Static pressure in each air

    duct.

    Water flow passing through each condenser, chiller, AHU etc.

    Differential pressure readings across each filter, fan and coil, and through each pump.

    Electrical current readings, in amperes of full and average load running and starting, together with name plate current of each electrical motor.

    Continuous recording over a specified period, of ambient wet and dry bulb temperat- ures under varying degrees of internal heat loads and use and occupation, in each zone of each part of the building.
  - Daily records should be maintained of hourly readings, taken under varying degrees of internal heat load and use and occupation, of wet and dry bulb temperatures, upstream "On-Coil" of each cooling coil. Also suction temperatures and pressures for each refrigerating unit. The current and voltage drawn by each machine.
  - Any other readings shall be taken which may subsequently be specified by the architect.

- Air Balancing

  All air handling/ ventilation equipments, duct work and outlets shall be adjusted and balanced to deliver the specified air quantities, at each inlet and outlet as indicated on the drawings.

  If these air quantities cannot be delivered without exceeding the speed range of the pulley or the available horse power, the architect shall be

notify, before proceeding with the balancing of air distribution system.

A proper record shall be maintained as per Test Proforma given else where.

- Water Balancing

  The output of water pumps shall be checked using the balancing valves, provided on the pumps, for this purpose, to ensure the output and pressures match the specified requirement.

  Then flow to Condensers/Chillers, Air handling units etc. shall be individually adjusted and balanced to match the flow rate as given in specifications/ drawings to meet the requirement.

  The balancing valves, provided on the equipments, shall be used for adjustment.

- Miscellaneous

  - The above tests and procedures are mentioned herein, for general guidance and information only, but not by way of limitation to the provisions of conditions of contract and specification.
  - The date of commencement of all tests listed above, shall be subject to the approval of the architect and In accordance with the requirements of this specification.

    The contractor shall supply the skilled staff and all necessary instruments and carry out any test of any kind on a piece of equipment, apparatus, part of system or on a complete system, if the architect requests such a test for determining specified or guaranted data, as given in the specification or on the drawings.
  - Any damage resulting from the tests shall be repaired and/or damaged material replaced, to the satisfaction of the architect without any extra cost.
  - In the event of any repair or any adjustment having to be made, other than normal running adjustment, the tests shall be void and shall be recommenced after the adjustment or repairs have been completed
  - The contractor must inform the architect when such tests are to be made, giving sufficient notice, in order that the architect or his nominated representative may be present.
  - Complete records of all tests must be kept and 3 copies of these and location drawings must be furnished to the architect.

    - The contractor may be required to repeat the test as required, should the Ambient conditions at the time, do not give, in the opinion of the architect, sufficient and suitable indication of the effect and performance of the installation.